

PC

The Independent Guide to
IBM Personal Computers

Volume 1 Number 9 \$2.95

Special Communications
Section: Hardware,
Software, Services and More

BATTLE OF THE NETWORKS

The Rise of IBM
Business Advice For
Software Authors
PCs in the
Executive Suite
Thoroughly
Modern Modems



ELECTRONIC MAIL:

The PC
Express



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File Maintenance

A-Add Items
B-Change Items
C-Delete Items
D-Transactions
E-Clear Sales

Reports

K-Item Inquiry
L-Master Listing
M-Over/Understock
N-Stock Status
O-Physical Inv.

Highlights

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G-Bar Charts
H-Report Generate
I-Directions OFF
J-Demo Data OFF

System Functions

P-Change Password
Q-Set Soft Keys
R-File Backups
S-Assign Files
T-Change Date

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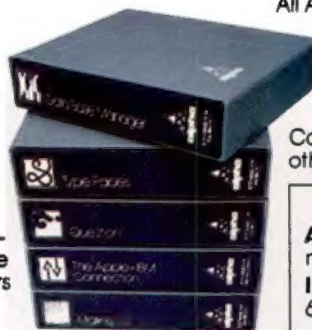
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The Independent Guide to
IBM Personal Computers

Volume 1 Number 9



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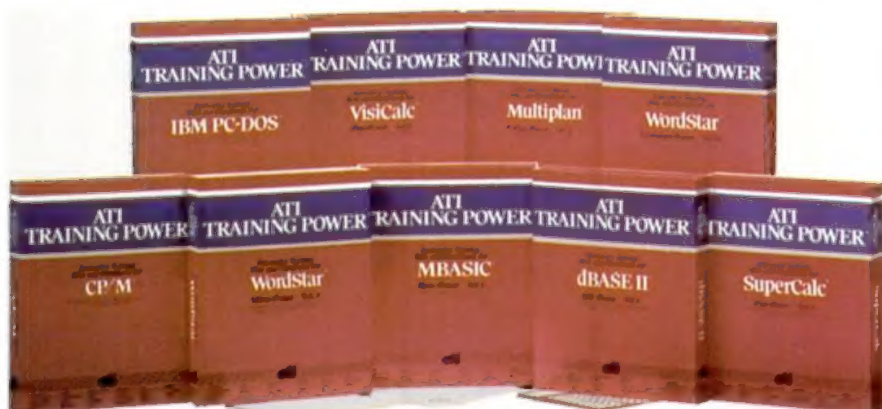
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10 function keys*	Printer All-points-addressable graphics capability Bidirectional*	Black & white resolution: 640h x 200v*
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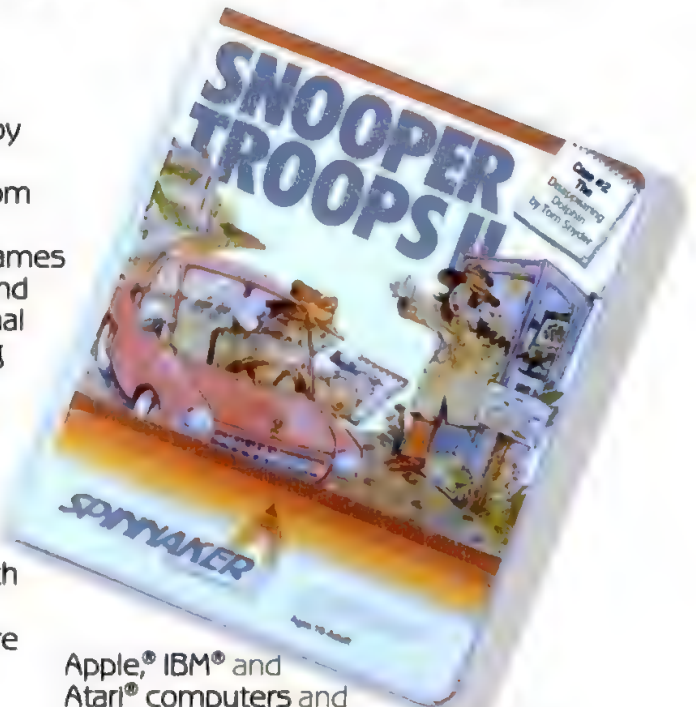
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Software, 215 First Street, Cambridge, MA 02142.



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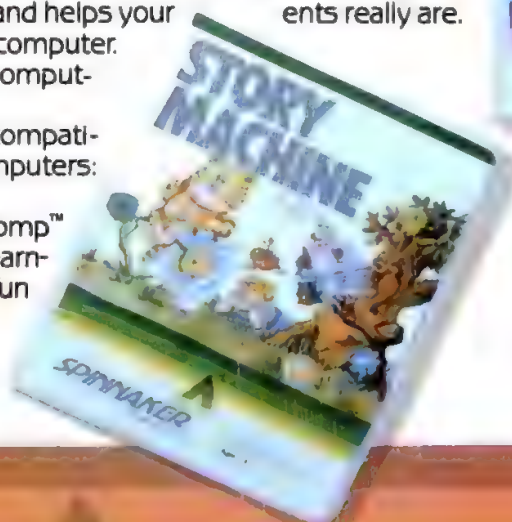
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And we're introducing new games all the time.

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Letters To PC

Why Didn't We Think of That?

PC is by far the best magazine on the market for the IBM PC. The articles are both intelligent and comprehensive. The advertisements are even well-placed!

However, there is always room for improvement. The magazine is in desperate need of a Reader Information Card! Why, last month alone, I spent over \$2 in postage stamps for product inquiries. I am sure that you will agree that for a magazine this size (and cost) a reader information card is a good investment for both of us.

John Benza
Greenwich, Connecticut

Funny you should mention it. PC features its first reader information card in this issue. — Ed.

A PC Revises the Bible

As an ordained clergyman and PC owner, I read with great interest "A PC Revises the Bible" (Volume 1 Number 6). I have to confess that I was very disappointed in the article.

Father Woodard is not using the computing power of the PC to revise the Bible. Perhaps (though not clearly stated in the article), he will use word processing on the PC to type his new version. If he used some text analysis methodology in which the PC was examining and amending the text, then it could be accurately stated that the PC was revising the Bible. All of the actual revision work was being done by the amateurs Father Woodard had dug up out of his congregation.

The IBM PC is a very good tool for helping man solve his earthly problems, but it will never be able to give him eternal life. I very much appreciate overall what you are doing to relieve the cognitive dissonance of all those who have spent thousands of dollars on IBM PCs.

My church has spent millions of dollars with IBM over the last decade on data pro-

cessing and word processing equipment. Some of the Biblical research carried on by the church is now being done on an IBM S/38 and a 3800 laser printer.



The computer definitely has a place in the church today but I was disappointed that your article made such a big deal out of nothing.

Reverend Bo Reahard
New Knoxville, Ohio

Irrational Estimates

I am getting a bit tired of reading irrational estimates of the number of IBM PCs sold in the first year of its marketing. *Business Week* even printed an estimate of 500,000, and one of your authors alluded to it as if it were plausible.

IBM has delivered fewer than 100,000 PCs in the first year. I challenge anyone to disprove this statement. The evidence is quite simple: citing a valid System Unit serial number greater than 200,000.

I took delivery of my PC more than a year ago, on October 31, 1981. ComputerLand of Ithaca, my dealer, told me it was probably the first one in upstate New York. Its serial number is 0101712. I hope that no one thinks that more than 100,000

units had been delivered by then. No, the explanation is simple. IBM adds a constant 100,000 to the actual production sequence number to arrive at the corresponding serial number for a given unit. This is common practice among camera manufacturers, so it is not without precedent.

Last week my company received a new PC bearing a serial number near 180,000; I claim it was approximately the 80,000th one made. I have checked with every PC owner I know. No serial number exceeds that one.

Unless one of your readers truthfully cites a higher number delivered prior to November 1982, I stand by my thesis. Let's be certain that everyone knows where to find the serial number. It's the number on the paper sticker above the keyboard connector on the System Unit's back panel.

Will anyone challenge me?

Paul F. Doering
Rochester, New York

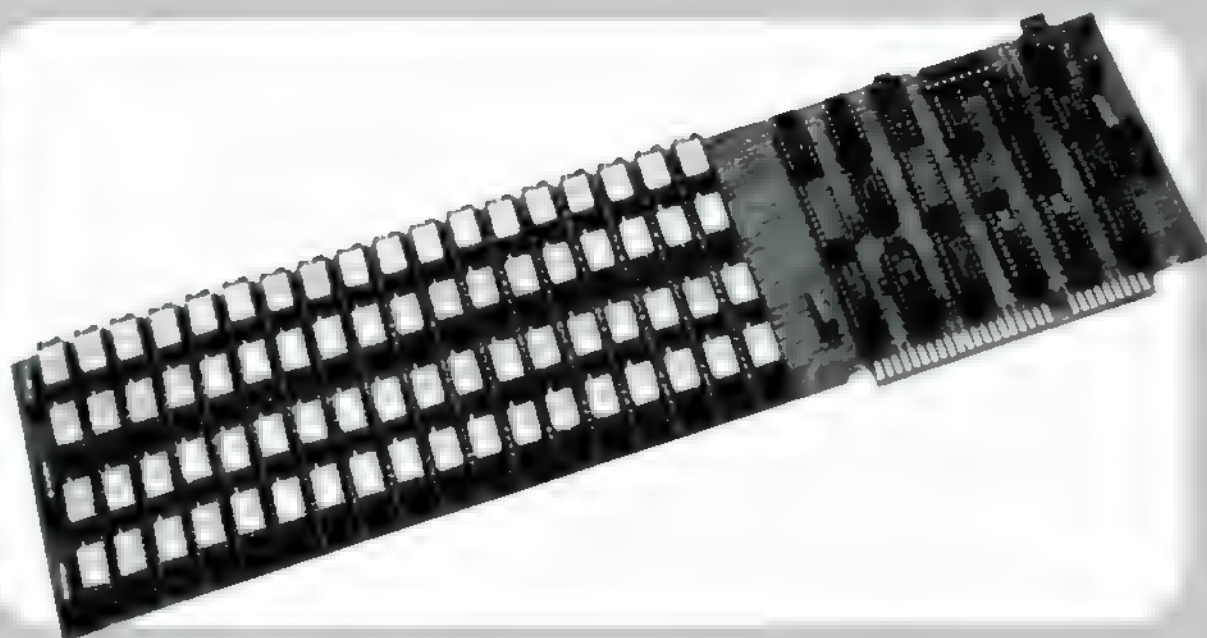
Broader Look Needed

I disagree with Mr. Les Cowan's conclusions in his review of *Practical Basic Programs, IBM Personal Computer Edition* (Volume 1 Number 6).

I purchased both *Practical Basic Programs* and its companion book, *Some Common Basic Programs, IBM Personal Computer Edition*. I fully expect to get my money's worth even if I use only a half dozen of the 116 programs in the two books. To obtain several useful programs for \$32.50 even if I have to enter them into the PC myself is a bargain in my book. The value I see in these programs is not only in having programs with appropriate applications, but also seeing spelled out in BASIC numerous techniques that I have not seen described in BASIC language teaching books. So what if I spend a few hours entering a long program and debugging it? The experience is worth it.

My reaction to Mr. Cowan's complaints

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that the checkbook reconciliation program does not take into account interest earned or clear the screen when complete is that I can modify it myself if I need those conveniences in the program. None of the programs in the books is gospel; all can be modified to meet one's particular needs if one wishes to experiment with them.

The only stake I have in these books is my own investment, but I believe they deserve a broader look than given in Mr. Cowan's review.

Bruce W. Wood
College Park, Maryland

A Challenging Word

Because we were anxious to be reviewed in the December issue of your magazine (Volume 1 Number 8), we sent *Word Challenge* to you before it was completely finished. The following characteristics of the game had not yet been implemented, or were still incomplete: color, Sound, Clean Disk, The "Spell" feature, Copyguarding, and Self-booting diskette.

In our dealings with you, we stressed that this was not a finished product and explained our plans to implement the above features. It appears that these communications were not passed on to the reviewers.

The documentation does provide detailed procedures for setting up *Word Challenge* (see page 5 of the manual). The unfinished version did not come equipped with our operating system, but we did send instructions on how to boot that version by copying IBM DOS onto the disk.

The method of scoring has been incorrectly described in the article. Of the five different scoring methods, only one scores 1 point per word. The other four methods, including the default scoring method, credit points based on the length of the words found as well as on the number of words found. These methods of scoring were in the version we sent PC.

Tracey A. Heffernan
Fort Lauderdale, Florida

WordStar Wrangle

MicroPro advertises *WordStar* in glowing terms, and indeed it is a fine word processing program, even "elegant" as Seymour Rubinstein has said. However, I think it's time that word processing software publishers started labeling their products in a more responsible fashion. Having purchased *WordStar 3.2M* for my PC with the

A lot of quality products from companies like Visicorp, Ashton-Tate, IUS, Hayes, and Corona Data Systems have made life for the IBM PC user a whole lot easier. And more productive.

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reassurance that WordStar "will run on literally hundreds of different, low cost, microcomputer configurations. . . [and] if you change your system or add new terminals or printers, the same menu allows modifications to the existing WordStar systems . . ."

I was indeed miffed to find that my \$500 investment would not drive the (preferred) proportional type font on my Centronics 737 dot matrix printer.

Andrew Fluegelman gave sage advice when he wrote "You should personally test the printer you plan on using to see how well the program supports it." Unfortunately, most purchasers of software are not as aware of such trivial details, and most dealer salespeople aren't either. I wonder how many hundreds of users have software sitting at home that won't work on their equipment? And I also wonder why software publishers don't place a small gummed label on each software package stating exactly which equipment the software will drive.

MicroPro, by the way, has shown exactly zero interest in my situation.

Fred Westendarp
Tempe, Arizona

Calling All Readers

I am a computer salesman who does not know how to program but would like to know how to get the most out of *DBASE II*. I intend to become an expert on *DBASE* and would welcome any assistance *PC* can provide. I would be interested in attending classes or user groups.

Peter L. Boehme
Castro Valley, California

PC is not aware of any existing classes or users group in your area specializing in *DBASE II*. Perhaps our readers will notify us when one becomes available.—Ed.

After reading between the lines of your "War of the Calcs" (Volume 1 Number 4), we purchased *SUPERCALC*. It's wonderful! Do you know of any *SUPERCALC* newsletter we could subscribe to? Keep up the good work. *PC* is one great magazine!

Gene L. Thomas
LaCrecenta, California

We are not aware of any newsletter devoted to *SuperCalc*. Readers?—Ed.

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CIRCLE 119 ON READER SERVICE CARD

A Distinction

Please refer to the article "The UCSD p-System," (Volume 1 Number 6), co-authored by Alan Freiden and me.

Naturally, we were pleased to see our article in print. We would have been even more pleased if we had had the opportunity to review galley proofs. The brief biography at the end of the article giving our affiliations is in error.

The bio describes me as a member of the faculty of George Washington University. Not quite. I am an instructor in the Information Systems Specialist Program in the Center for Continuing Education at George Washington University. This is not a regular, full-time faculty appointment. The distinction may be small in the readers' minds, but it makes a difference to my academic colleagues.

More important, the note completely omits the fact that Alan and I are affiliated full-time with Ferox Microsystems, Inc. Alan is Director of Advanced Projects and I am Vice President of Research and Development.

Thomas H. Woteki, Ph.D.
Arlington, Virginia

Random File

Really excited about your fabulous magazine and have been since the charter issue. My input comes in reaction to B. Boasso's article "Using Data Files" (Volume 1 Number 6). Some common untruths should be cleared up regarding three points made about random files. First, the default buffer size for a random file is 128K, not 256K. Second, EOF (End Of File) function does not function for random files, only sequential processing. Third, LOF (Last Of File) function does not return the last record number used in the file (as it does in the popular C-BASIC). It returns the length of the file in increments of 128 bytes, so a simple conversion must be made ($N = \text{Int}(\text{LOF}(\#) / \text{LRECL})$) to determine last record number.

Paul Reed
Barker, Texas

No Razzle Dazzle

With great enthusiasm I read B. Boasso's article on "Using Data Files." I've awaited this article since you pre-announced it, as I'm new to the world of the Personal Computer and have enjoyed commercial pro-

gramming and design for 14 years. OK... here goes.

In a word, it's AWFUL! Much of what the author states as useful, informative fact is incorrect, misleading, and generally indicates he never wrote disk programs in PC-DOS BASIC. In fact, a central message of the article is that through some pretty fancy programming, one can pack 8 records in a Random File sector.

This is the classic case of a 'solution looking for the problem.' PC-DOS BIOS, as everyone but the author knows, wastes not a byte of precious disk in storing random file records. Ergo, 8-64 byte records would have fit nicely into a sector, fully addressable as discrete logical units, without his "razzle-dazzle" on P. 111-112.

Further, please advise this misguided soul of these additional revelations:

1. The Disk buffer defaults to 128, not 256. He's thinking of the Communications buffer, perhaps.

2. The EOF function is rarely, if ever, used for Random Disk processing. Again, Communications must be on his mind.

3. The LOF function returns the number of bytes allocated to the file, not the last record of the file. If he meant LOC he would be closer to the fact, but still no cigar!

4. In his Figure 2, using a buffer length of 512 is inappropriate to his example (should have been 64).

Gadzooks... methinks Boasso must own a TRS-80!

Sir, I still love your magazine, but you owe me one in the Programming Techniques category.

Sam M. Gerber
Philadelphia, Pennsylvania

We Hear You

I have been reading your magazine through thick and thin. I enjoy PC and hope it continues for a long time. I am interested in articles that help me make more effective use of my IBM PC. This includes articles that relate to new hardware offerings, software, techniques, etc. Reviews of games don't do much for me. I have an Atari for that.

Some suggested articles for the future: modems (Who makes them? What are desirable features?), the ins and outs of DEF SEG in BASIC, what can be done with the IBM (Epson) printer, ways to handle strings in BASIC, introduction to using the

PC assembler. I could go on but I think you get my interest areas.

Keep up the good job and may you pass Byte in circulation.

Alan L. Rast
San Antonio, Texas

Thanks for your suggestions. PC always appreciates new ideas from readers. Please see "Selecting The Right Modem" and "Modems With Minds Of Their Own" in this issue to learn more about you know what. — Ed.

Some Suggestions

Great magazine! Two ideas about your index to advertisers in back of magazine.

1. Index by product name in addition to company. Thus if I want to look up DBASE II I would see it, not just Ashton-Tate.

2. List by product groups

1. Terminals
2. Databases

Cliff Meyer
San Francisco, California

Corrections

Due to an editing error, PC included references to certain products in the article, "The Hards and Softs of Ergonomics" (PC, Volume 1 Number 7, page 225). In no way does the author, Mr. Richard Koffler, recommend or endorse the products mentioned. PC regrets the error and any inconvenience caused to Mr. Koffler.

On page 44 of the same issue, an error appeared in the MONO.COM and COLOR.COM program listing on page 44. In line 80, F\$ should be followed by a comma rather than a semicolon. The correct sequence is F\$, rather than F\$;. This correction also applies to line 120.

Sharp-eyed readers pointed out the omission of the correct tenth decimal place in Figure 3 of "Baking Pi In Your PC" (PC, Volume 1 Number 8, page 192). Pi calculated to 97 decimal places should begin 3.1415926535897932384626433... Our thanks to those readers who spotted the error.

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APPLICATIONS

CIRCLE 380 ON READER SERVICE CARD

Terminal Miscalculation

During the last half-dozen years, the pace of change in the personal computer world has been lightning fast. In telecommunications, however, change is coming as slow as molasses. No one seems to be paying attention to the fact that we are now dealing with communicating computers, not mere terminals.

Dumb and Smart Terminals

A terminal is basically an input/output device. Information can be entered via the keyboard into a computer, and the computer can send information out to the user via the screen or printer. Early terminals were specially connected teletypewriters, and subsequent models became known as glass teletypes because they replaced the paper and ribbon with a TV display.

Later still, terminals were referred to as dumb terminals, to contrast them with a newer smart generation of terminals. What made the newer ones smart were features that are now considered rudimentary, such as the ability to cause display of a character at any desired point on the screen (cursor positioning) or to erase all contents on the screen. These features were activated by special sequences of control characters, and their performance was far superior to previous models'. Erasing a dumb terminal's screen, for example, was usually done by sending 24 consecutive rows of blanks. The operating speed for computers at that time was 30 cps; at that rate the screen would clear in a minute.

Eventually, very smart terminals appeared. These terminals had built-in memory, which made it possible to type in a page of data, edit the text for corrections, and then have the terminal send out the finished page in one burst. The terminal's



smartness, however, was applied mainly to jazzing up its power as a terminal; it did little, if any, real computing.

Until personal computers were developed, almost all computers operated through terminals. PCs are making the concept of terminal-oriented computers outmoded. Keyboard and display subsystems are fully integrated into the PC unit, making both systems more responsive. A personal computer can act as a terminal by running a program known as a terminal emulator. PCs connected to phone lines using modem devices ordinarily utilize this method to link up with distant computers. What a waste! A wealth of computing power is on tap, and all it gets used for is to make a computer imitate an obsolete device. Following are just a few ways to put some of that untapped computing

power to work.

Speedup Communication

The average speed of computer communication is increasing, especially as new technology makes 120-cps (1200-baud) modems more affordable. The inherent limitations of phone lines restrict communications speeds to 4800 baud, and the hardware that does that still costs more than an entire IBM PC system. According to a recent study reported in *The Economist*, the bulk of all text is assembled from 1,000 oft-repeated words, and that up to a ninefold improvement in transmission speed might be gained by transmitting these words as number codes. Any PC with a spelling checker program has almost everything necessary for such a scheme.

Further improvements could be made by using other coding tricks that require computer power. One possibility for a 20 percent gain in speed is to dispense with the start and

stop bits that now bracket every character when the asynchronous communications method is used. Start/stop bits are useful when communication consists mostly of randomly timed entries from a keyboard; but in a continuous operation such as sending or receiving a disk file, the computer should be able to say, in effect, "I'm sending a stream of stuff here. Don't look for start or stop bits anymore until I tell you otherwise." The general rule for this generation of personal computers is that processing is cheaper than bandwidth.

Speedup Interaction

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CIRCLE 374 ON READER SERVICE CARD

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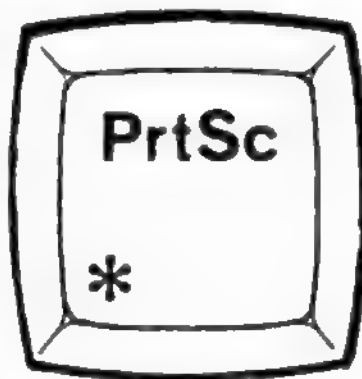
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Utility and Pleasure

David Winer, of Living Videotext, Inc., has designed a prototype program that en-

MULTIPLAYER
games offered on
communications
networks could
employ each user's
local PC power for
graphics, animation,
and sound.

hances CB radio simulation on CompuServe. Instead of scrolling the keyboarded chatter onto the screen as it is typed in, the program listens to the transmission and then processes it to help users interpret the messages more easily. Each CompuServe CB transmission is prefixed by the handle (assumed name) of the sender. Winer's program watches for these handles and acts as a traffic cop by reserving an area of the screen for each party active in the conversation, and then directs the transmissions from each party to be displayed in their reserved area. This organized visual framework makes freeform dialog more comprehensible. Winer's program is one example of an extensible principle of telecommunications. Multiplayer games offered on communications networks could employ each user's local PC power for graphics, animation, and sound.

The possibilities are plentiful, but exploiting them will require a change in perspective. The new perspective must come from you and me, the users. We know that personal computers are not just terminals. It's time we made them live up to their potential as advanced communications tools.

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PC-Communications

A compendium of facts, news, opinion, intelligence, speculation, and forecasts about IBM Personal Computers

The Literary Life

Copies of *Blind Pharaoh*, the first completely electronic novel, are now available on The Source. The novel, written in 61½ hours by Canadian writer Burke Campbell, drew national attention upon publication. Campbell wrote on an Apple III using Apple Writer word processing software. Chapters were proofread on a second Apple III equipped with a printer.

Access III communications software and a Ven-Tel 1200-baud modem were used to transmit text to an Apple III in Toronto. The novel was carried on the DataPac communications network in Canada and Tymnet in the U.S.

With the first computerized novel already here, can a PC bestseller be far behind?

Graphic News

If you are looking to create graphics, IBM's new graphics printer will be available this month. An enhanced version of the existing IBM PC matrix printer, the 80 characters per second, bidirectional printer includes all points-addressable graphics capability with up to 240 dots per inch horizontally, 216 vertically.

It also features two character sets. One set is similar to the video display character set; the other adds international characters enabling users to print French, Spanish, Italian and German. It includes superscript and subscript capability and an underline mode.

The matrix printer can be upgraded to a functional equivalent of the new graphics printer. A conversion kit will be available beginning January



1983 for a 90-day period. It can be installed, however, only by IBM Personal Computer dealers. Conversion price will be set by individual dealers. Dealers will also be able to update DOS 1.0 and DOS 1.1 to support the new Graphics Printer. Product Center price for the graphics printer is \$595.

Latest Releases

IBM's Software Submissions Program is alive and well. Under the plan independent software authors can submit programs developed for the PC for publication under the IBM logo.

IBM recently released a

smorgasbord of programs ranging from the IBM Personal Computer Casino Games package (poker, blackjack, and slot machine included) to the BASIC Programming Development System.

Personal Editor, a full screen editor, is available along with the IBM Personal Computer Diskette Librarian, which creates and maintains a

catalog of file names for users working with numerous disks.

Other issues include the IBM Personal Computer Multiplan, by Microsoft, a spreadsheet simulator that performs numeric modeling and planning and pfs: FILE and pfs: REPORT by Software Publishing Corporation. pfs: FILE is an information management program for business, home, or educational use. REPORT allows users to produce custom reports from files created by pfs: FILE.

A Cornucopia of Warranty Options

New PC service options are now available for purchase from participating dealers. PC buyers may choose from between a 9-month nonrenewable option that may be requested at the time of the initial product purchase and a 12-month, renewable option that may be requested during the initial 90-day warranty period.

Separate options are available for the system unit, printers, and the monochrome display. The 9-month system unit option includes software, with coverage limited to failure of the disk. PC owners whose original 90-day warranty was

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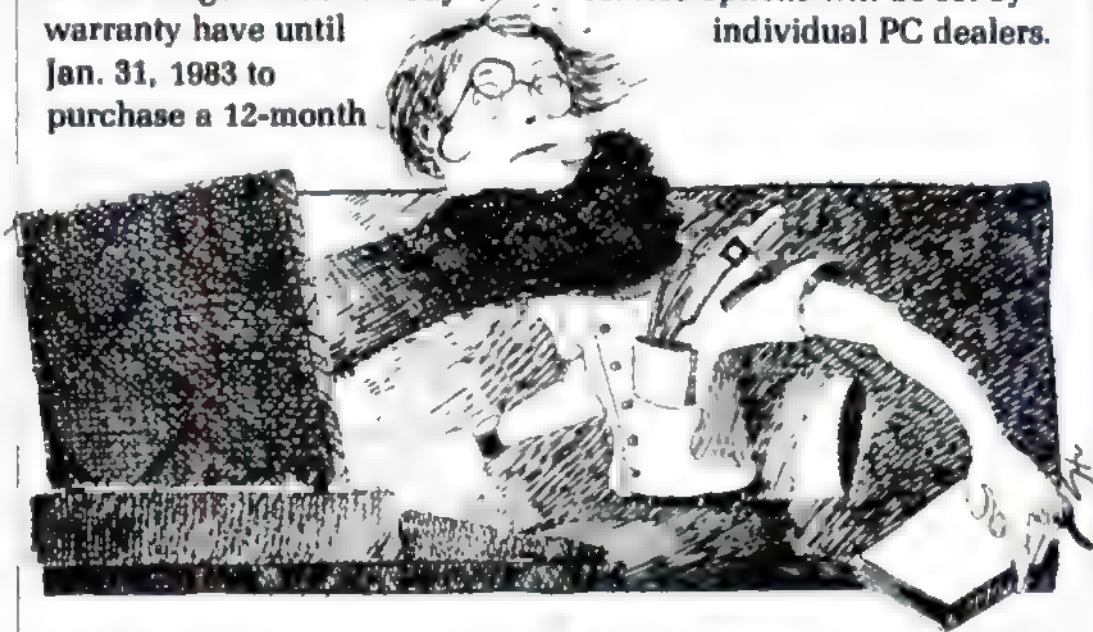
—The Wall Street Journal
December 15, 1982

still in effect on Nov. 11, 1982 may purchase a 9-month dealer service option until their warranty expires.

PC owners whose products are no longer under 90-day warranty have until Jan. 31, 1983 to purchase a 12-month

dealer service option, provided their system is verified to be in working order by their authorized dealers.

Prices for new dealer service options will be set by individual PC dealers.



Distributing Doldrums

Are microcomputer distributors suffering because manufacturers provide direct support to dealers? And more to the point, are computer product consumers going to suffer?

A report, "Distribution Strategies of Personal Computer Manufacturers" by Strategic Incorporated, a research and consulting firm, shows that direct support from dealers is causing distributors to cut back on their product lines. This will make it easier for foreign competitors to persuade disgruntled distributors to start carrying their products. By doing this, foreign manufacturers can circumvent the need to set up their own distribution network.

The report also indicates that retailers are limiting their inventory and product lines, selecting only complementary products, and eliminating low-profit, slow moving product lines.

Copies of the 240-page report are available for \$2,500 from Strategic Incorporated, 4320 Stevens Creek Blvd. #215, San Jose, CA 95129.

Along These Lines

Reading my PC magazine or any of a number of other micro magazines, I am reminded of a



comment by Professor Seymour Papert: "... there is a tendency of the first, but still primitive, product of a new technology to dig itself in." Consider the users of microcomputers. Those we read about who use the PC are the professionals, industries, educational institutions, personal users, and small businesses.

Where are the Fortune 500 guys, companies with at least two 16-megabyte mainframes and several hundred 3278-type CRTs in the building of corporate headquarters or government institutions? Aren't they using PCs? Are they using PCs as stand-alone devices, or are they tied to the host like a local 3278-type device on a channel? Wouldn't it be nice if the PC processor could be connected to an IBM 3278 screen and the user could switch from CICS, IMS, or TSO/SPF on the host to VisiCalc, EasyWriter, or a game on the PC? Will it take one, two, or three months before IBM offers a distributed processing solution along these lines?

Paul K. Winter
Toronto, Ontario

Video Ventures

Is the way to a techie's heart through his or her video game? Entertainment services and video games are a key to the mass market acceptance of new electronic media systems and services, according to the "New Media Five Year Outlook," a research report produced by LINK Resources, a New York market research and consulting firm. The report notes that consumers in North America and Europe were attracted by video entertainment before turning their attention to any other kind of computer product.

Video entertainment expenditures include pay TV, videocassettes, and videodisc software. The study is currently available only to LINK clients but may be released for the general market shortly.

PC-Communiques

Readin', 'Ritin', 'Rithmetic, and PCs

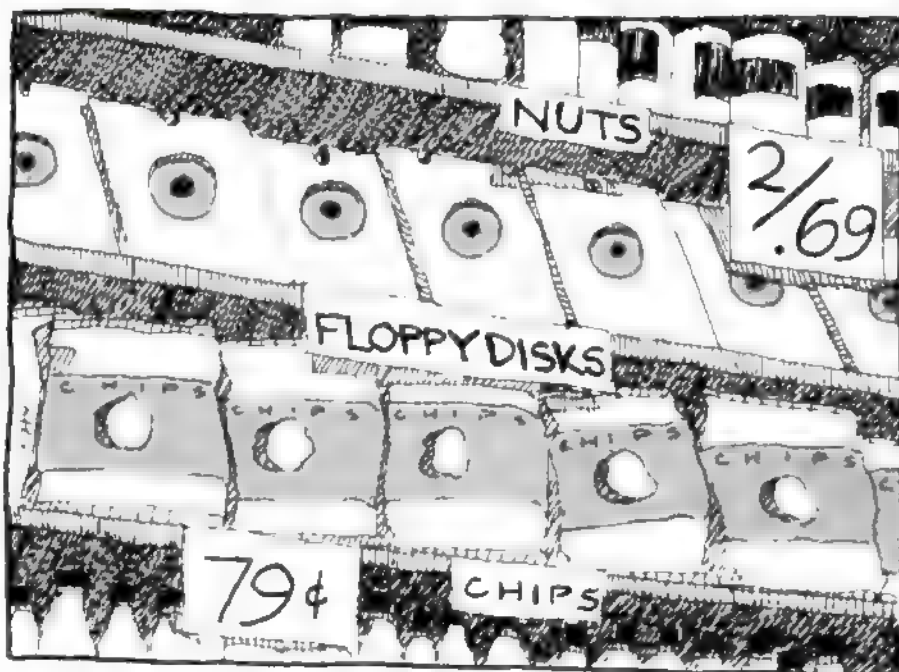
More PCs may be turning up in classrooms due to the price allowances IBM is offering accredited public and nonprofit private schools at all levels. The price allowances will vary by the system configuration and are exclusive of any other IBM discount.

A typical base configuration consists of a System Unit, including keyboard and 64,000 characters of user memory, disk drive and color/graphics adapters, a single 160K disk drive, and IBM's Disk Operating System (DOS). It sells for \$1,995 at IBM Product Centers. The usual Product Center price is \$2,545. Prices may vary at other participating authorized IBM PC dealers.

"There is very little education software that can't conform to the base configuration," said Jeff Levinsky, cofounder and director of Research for Interactive Sciences, Inc. (ISI). ISI is a nonprofit organization that conducts research and develops programs in computer education.

Adding a monochrome monitor or an interface with a color television set to the base configuration would probably be beneficial for a class, Levinsky said. IBM's new graphics printer and the monochrome display are also discounted.

School administrators who want to purchase 20 or more PCs must contact education marketing representatives of IBM's National Accounts and National Marketing Divisions.



Milk, butter, eggs, floppy disk ...

Now you can add software, printers, and disks to the other items on your shopping list. In an agreement announced at COMDEX '82, the Sorbus Service Division of Management Assistance Inc. (MAI) signed an agreement to become a full service arm for Avnet, Inc.'s Computer SuperStores.

The SuperStores will sell

microcomputer products, software, and supplies while the Sorbus Station repair centers will provide on-site maintenance service and warranty repairs.

The first two Sorbus Stations will open inside the Computer SuperStores in Phoenix, Arizona and Albuquerque, New Mexico. The SuperStores/Stations will operate 12 hours a day, 7 days a week and will be backed by the Sorbus network of 1,200 technical support personnel.

PC Baedekers

Two new guides to PC products have been announced. The first edition of *The Guide to Personal Computer Offerings* from IBM is available now through authorized dealers. The 84-page guide covers system hardware; service options; software products, including business and education programs; as well as operating systems and languages. Cover price is \$3.

A new edition of Que Corporation's *IBM PC Expansion & Software Guide* is slated for April publication. The Guide provides information on computer products, companies, and communications in general. The Guide will be available at computer stores and bookstores.

PC- Communiques Pays

Do you have news, gossip or unusual computer tales for PC-Communiques? We will pay up to \$50 for each submission used. You must include your name, address, and telephone number with the item. We will preserve your anonymity if you wish. All submissions become the property of PC and are subject to editing. Our User-to-User section also publishes and pays for readers' submissions; that section features tips, problem solutions, and short programs or routines. Please send submissions to the appropriate department—PC-Communiques or User-to-User at PC, 1528 Irving St., San Francisco, CA 94122.

Asynch Updates

Asynchronous communications support (ACS) program users take heart. IBM is planning to revise its asynchronous communication support program. Version 1.0.

Further information is sketchy at this time, but watch this column for further updates. See "No Frills Communication From IBM" in this issue for more on Version 1.0.



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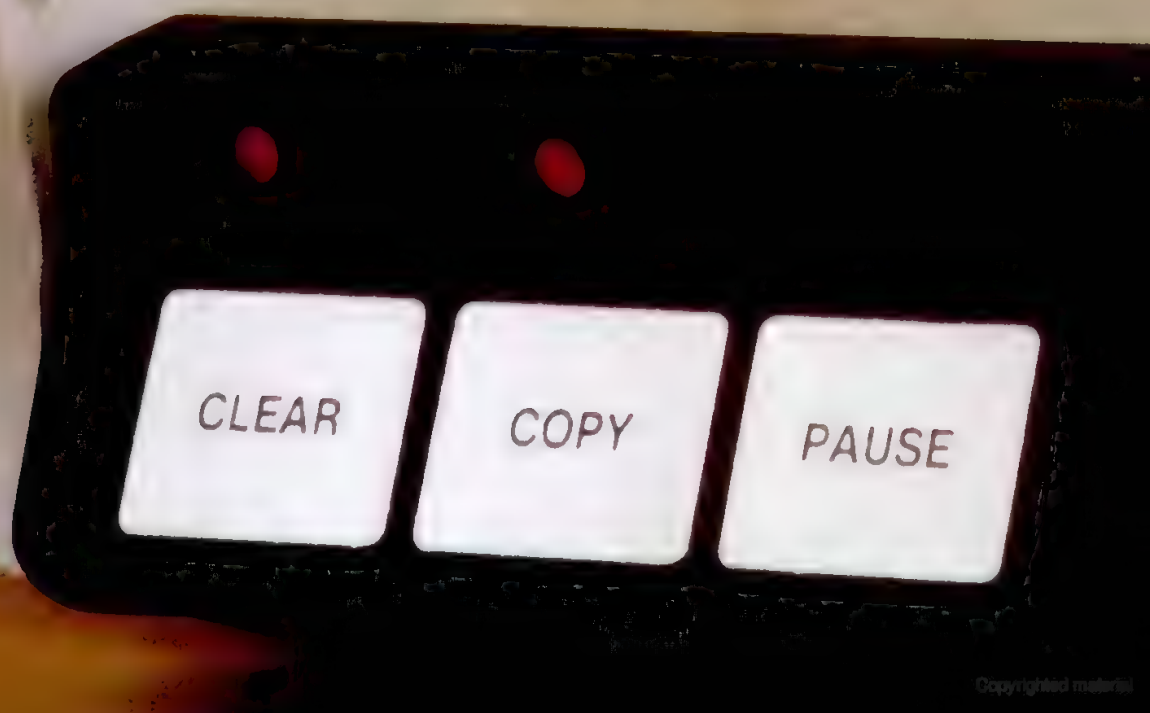


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FOR EPSON PRINTERS, Microbuffer is \$159 in either an 8K serial or a 16K parallel version. The serial buffer supports both hardware handshaking and XON-XOFF software handshaking at baud rates up to 19,200. Both interfaces are compatible with Epson commands including Grafrax-80 and Grafrax-80+.

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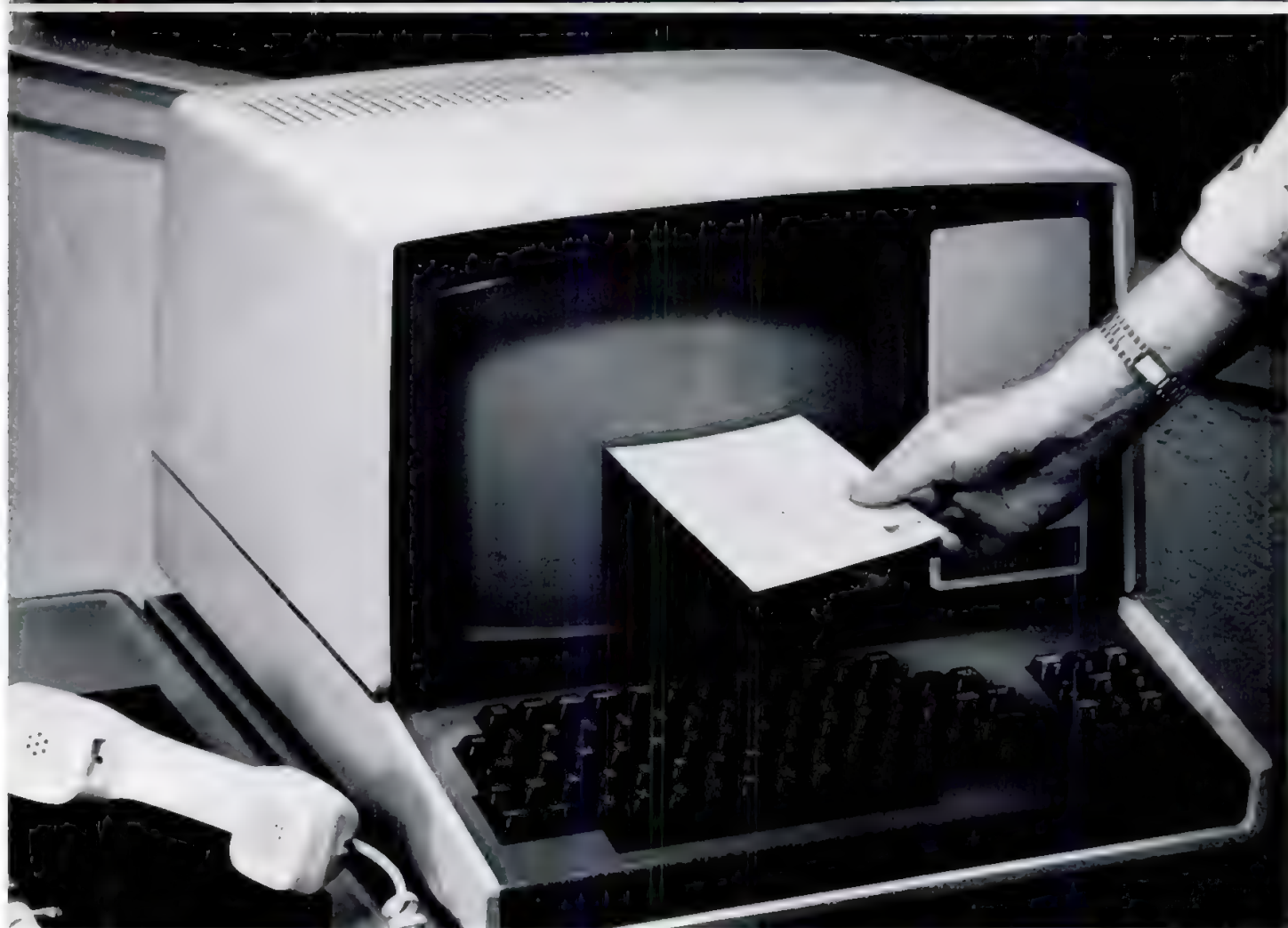
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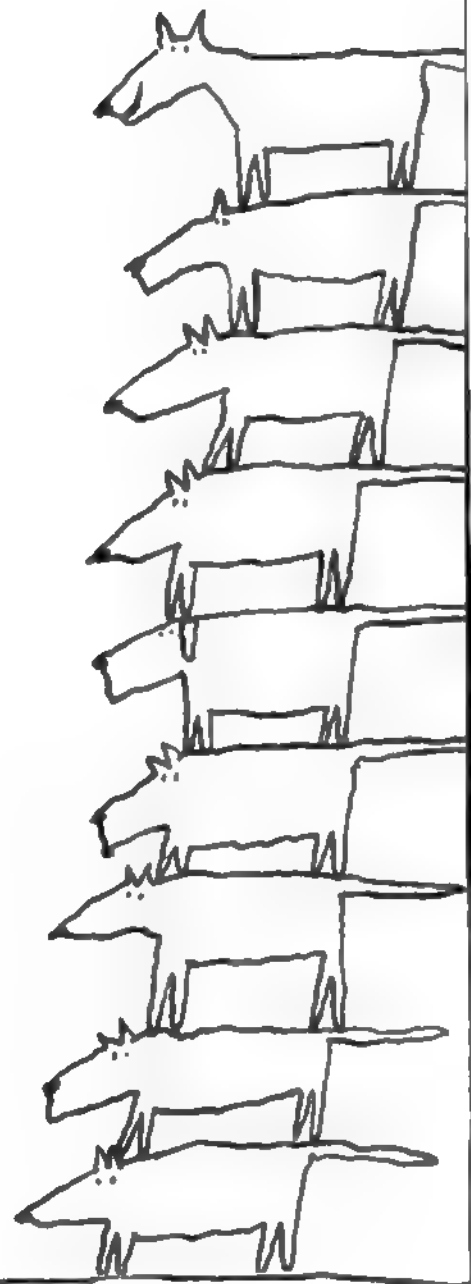


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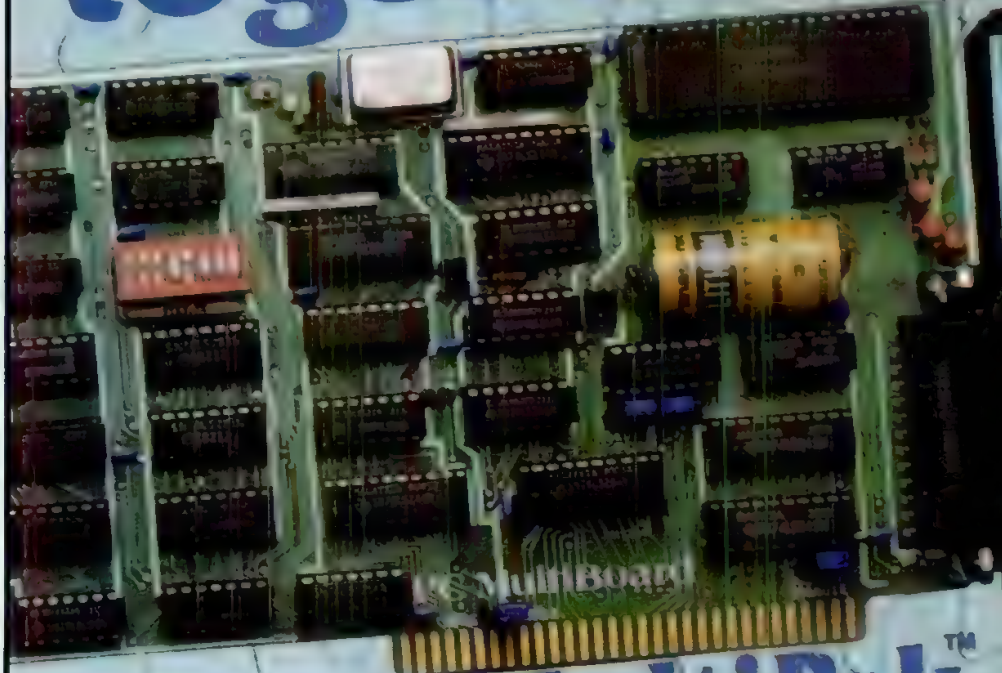
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PC Tutor

Connecting a daisy wheel printer; finding when DOS can come in out of the drive; and explanations of precision, error checking, and hexadecimal numbers.

Cabling a Printer

Q: I recently purchased an Anderson Jacobsen AJ-832 daisy wheel printer. I connected it to my IBM asynchronous card, but nothing seems to make it start printing. Does the PC only support an IBM printer? I know the printer is working because it also operates as a terminal, and it works fine when I connect it directly to my modem.

Martin Roberts
Atlanta, Georgia

A: If you have DOS version 1.1 or later, the AJ can be made to work just like the IBM printer. However, you need to do a few things. First, every time you boot the system, you must convince the DOS that the printer is connected to a serial (asynchronous) port rather than to the usual parallel printer port. This is done with the MODE program. Insert the DOS disk into the A drive and type:

```
A>MODE COM1:300,...P
```

```
A>MODE LPT1:=COM1
```

The first command initializes the serial port (COM1) for 300 baud and a connection with a serial printer. The default values of even parity, 7 data bits, and 1 stop bit are compatible with most printers, including the AJ, and do not need to be changed by this command. The second command redirects the line printer output to the serial (COM1) port.

After running the MODE program, you'll probably find that the printer still does not work. This is because the cable between the serial card and the printer is not wired correctly for this application. Both the AJ and the PC act like terminals. This means that both devices transmit data on pin 2 and receive data on pin 3 of the 25-pin DB-25 connector. To connect the transmitting pin of one device with the receiving pin of the other, you'll need to switch the wires in the cable. Connect pin



3 of the serial port to pin 2 of the printer, and pin 2 of the serial port to pin 3 of the printer.

The new cable will also need a jumper between three pins on the asynch port connector. The problem is that the IBM software assumes that a modem, rather than a printer, is connected to the serial port. A modem is expected to handshake with the PC; that is, signals indicating readiness are passed back and forth between the modem and the PC. Take note of the functions of the following pins.

- Pin 4—Request to Send (output from PC). This line goes high (between 3 and 15 volts) when the PC has a character to transmit. The DOS software leaves this pin high until a character is received or the port is reset.

- Pin 5—Clear to Send (input to PC). This line tells the PC that the modem is ready to receive a character. In the ready state, the line goes high.

- Pin 6—Data Set Ready (input to PC). This line goes high when the modem is ready to work. This happens, for example, when the modem is turned on.

- Pin 20—Data Terminal Ready (output from PC). This line should go high when the PC serial port is ready to receive or transmit a character. In practice, the software turns this line on the

first time you transmit or receive a character. It stays on until the serial port is reset.

Since your printer probably does not use these handshaking lines, you can jumper the PC's Clear to Send (Pin 5) and Data Set Ready (Pin 6) lines to its Data Terminal Ready line (Pin 20). When the PC is ready to do anything, its own high signal will return on its input lines and convince the operating system that the serial port is ready for anything. It is usually better to jumper these pins to each other, rather than to connect them to another source of voltage, in case the serial port needs to receive a specific voltage. The two devices should also be grounded together through Pin 7 at both ends of the cable.

Most printers don't have a handshaking function. If yours can handshake, then you might try connecting the printer's Data Terminal Ready line to the serial port's Data Set Ready and Clear to Send lines. For most printers, however, the completed cable should be connected as follows:

SERIAL PORT PIN	PRINTER PIN
2	3
3	2
7	7

Pins 20, 5, 6 are jumpered.

The assembled cable will have only three wires, and a jumper on the connector to the serial port. This connection allows you to use many DOS features like print screen, but will not provide error checking for "out of paper" and "printer buffer full" that normally comes with DOS. At 300 baud, however, the lack of these checks will not be a problem.

Resident Disks

Q: I have noticed that when I finish run-

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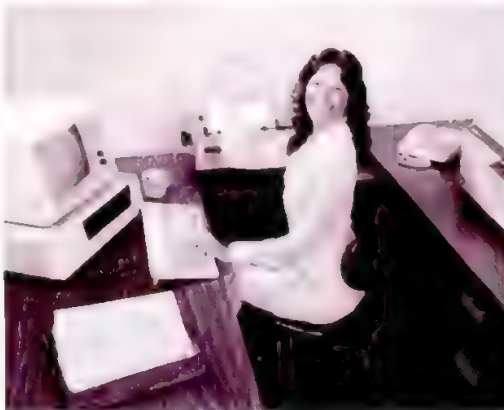
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ning DISKCOPY, I have to reinsert my PC-DOS disk into the A: drive. Is it necessary to leave the DOS disk in A: all of the time?

Elena Pirov
Burlington, Vermont

A: Much of the time you do need to leave a disk with the PC-DOS system on it in drive A:, but not always. To understand why, you need to know how PC-DOS is organized.

PC-DOS is made up of three separate parts. The first part is a very primitive operating system called Basic Input-Output System (BIOS) that resides in read only memory (ROM) chips on the system board of the PC. The other two parts are software included on any disk with PC-DOS.

BIOS contains the very lowest level subroutines of PC-DOS. For example, BIOS is called when the READ routine on disk needs to be told which sector, track, side, and drive is to be read. BIOS, however, knows nothing about files and cannot print error messages. Its subroutine for time of day just returns the number of counts (about 18.2 occur per second) that have occurred since the machine was turned on. BIOS resides at the highest possible addresses, from locations F000:E000 up to the highest possible address of F000:FFFF.

The next part of the operating system is contained in two hidden files, IBMBIOS.COM and IBMDOS.COM, on any disk that includes PC-DOS. You usually can test if the system is on a disk by running CHKDSK, which will list the two hidden files. These two files get loaded when the PC is turned on and every time you reset the machine by pressing Ctrl-Alt-Del. The two files are stored in low memory addresses starting at location 0000:0500. Once IBMBIOS.COM and IBMDOS.COM are loaded, they never need to be reloaded, unless you reset the PC.

The area in memory that stores those two files also holds a small piece of the COMMAND.COM program. This portion of PC-DOS provides all of the system calls used by applications routines. For example, one subroutine creates a new file on your disk; another subroutine returns the size of a file. The "Abort, Retry or Ignore" message comes from this part of PC-DOS.

The last part of the operating system is the remainder of COMMAND.COM.

This is the part that may need to be reloaded from the PC-DOS disk after you run a program. COMMAND.COM is stored at the top addresses of RAM. Thus, if you have a system with 64K RAM, then COMMAND.COM will be stored at addresses starting at about decimal 60,000. The COMMAND.COM program is the portion of PC-DOS that actually communicates with you at the keyboard; it prints

ADDRESSES are always listed in hexadecimal (hex) notation.

"A>". COMMAND.COM also includes internal programs. These are COPY, DATE, DIR, ERASE, PAUSE, REM, RENAME, TIME, and TYPE. Once the "A>" (or "B>") prompt appears on the screen, any internal program can be run, regardless of the disk currently in the disk drive.

COMMAND.COM is treated as a temporary program in RAM. This means that applications programs can use the memory space that COMMAND.COM normally occupies. If other programs have not forced COMMAND.COM out of that space, there is no need to reload it. For a system with 256K RAM, this is why running DISKCOPY requires a PC-DOS disk in drive A to restore COMMAND.COM after copying a double-sided disk, but does not need it for copying a single-sided disk. The single-sided disk takes up only 160K, which fits comfortably in RAM without overlaying COMMAND.COM.

The external programs that are included on the IBM DOS disk, like CHKDSK and DISKCOPY, are never required to be in any drive, unless you want to run them.

Lifting the Hex

Q: When I look through my technical reference manuals and my PC-DOS manuals I see all of the addresses written in a style such as 0040:0000. For instance, on page E-2 of my PC-DOS manual, it says the single drive mode status byte resides at location

0050:0004. What does this mean? Why aren't addresses always written as numbers like 5 or 1200?

Christian Marouby
Oxford, Ohio

A: The first thing to remember is that addresses are always listed in hexadecimal (hex) notation. The term hexadecimal refers to base 16. For example, the hex number 32 in base 16 translates to the base 10 number 50 in decimal notation: $(3 \times 16) + (2 \times 1) = 50$.

Hexadecimal numbers are used for memory locations because of the physical arrangement of the 8088 address lines. The 8088 has 20 address lines; each line may be a 0 or a 1 (binary). Thus, you might expect to see a 20-digit address as 00010011010001111011. Reading from right to left, this indicates that address line 0 is a 1, address line 1 is a 1, ..., and address line 19 is a 0. Older computer languages often relied on binary notation, but it is clumsy to use and hard to read. The 20 lines can be represented by hexadecimal notation, which is more convenient. Each segment of four lines is treated as a binary number with a decimal value between 0 and 15. The binary number 0000 becomes a hexadecimal 0 and the binary number 1001 becomes a 9. Since decimal notation does not provide single digits to represent the values from 10 through 15, hexadecimal notation uses the letters A, B, C, D, E, F. Thus, binary 1110 is decimal 14 or hex E. The 20-bit binary address 00010011010001111011 can be divided into five segments, (0001) (0011) (0100) (0111) (1011), and written as 1347B in hexadecimal.

Addresses sometimes are written as 5 hex characters, but for the 8088 in the PC, another notation makes more sense. The 8088 computes every address by combining an offset address of 16 bits (4 hex characters) with a 16-bit segment address. Instead of adding the two addresses together as they are, the segment address has an implied zero attached to its end, and then the two addresses are added. For example, if the offset is 0304 and the segment is 1012, the segment address is changed to 10120, and the address used is 10424 (the sum of 10120 and 0304). This process is exactly what the DEF SEG command means in BASIC: use this segment value.

Physically, the 8088 contains 4 segment registers, called ES, DS, CS, and SS (extra

segment, data segment, code segment, stack segment). Because an offset address is at most FFFF hex (a decimal value of 65,535, abbreviated as 64K), the largest continuous segment is 64K. The segment can begin anywhere, dependent on the value of the associated segment register. Usually, it is easiest for a program to set the segment register values once and then forget about them. This procedure explains why BASIC cannot handle more than 64K of data and 64K of code. BASIC always uses the DS register (which is essentially fixed) for data addresses, and the CS register for code addresses.

An address is written as, for example, 0050:0004 to imply that some segment register is set to 0050 and an offset value of 0004 is used. The address 0050:0004 is really 000504 in hex, but the first format is more informative. That same physical address could be named 0000:0504 or 0010:0404 for different register setups.

Precision Quirks

Q: Why is it that the following BASIC Program gives the wrong answer? It prints "0.999999" instead of "1."

```
10 A = 1/60
20 print 60*A
```

Randall Davey
Placentia, California

A: The reason has to do with the way rational numbers are stored in a machine's internal precision. Take a simple example. Suppose you wanted to find $3 \times (1/3)$. If you calculated it on paper, you would first divide 1 by 3. This comes to 0.3333333... in decimal notation. You might approximate this as 0.3333 to save space on your paper. Now, multiplying this value by 3 gives the result 0.9999, not 1. The same thing happens internally in computers.

Computers are binary machines, not decimal, but the effect is the same. Internally, the number $1/2$ is represented in binary as 0.1, the number $1/4$ is represented as 0.01. The number $7/8$ is represented as 0.111 ($1/2 + 1/4 + 1/8$). Now, suppose that the computer only keeps 6 binary digits of precision. The number 0.1000001 will be stored internally as 0.1, losing the value in the seventh place. If you then write the binary expression $1 + .000001$, the computer first adds 1 and .000001 to get 1.000001, throws away the seventh digit, and saves 1 as the answer. The seventh

digit may look insignificant, but an equivalent error in decimal notation would mean that the expression $64 \times (1 + 1/64)$ re-

COMPUTERS are binary machines, not decimal, but the effect is the same.

turns a value of 64, not 65! There is really no way to get around this. Even if the number is stored in decimal notation (called BCD, for binary coded decimal), round-off errors will still occur.

Storing numbers in binary notation has advantages and disadvantages. Binary notation can retain more places of precision than decimal notation, in an equal number of storage bits. For example, two bytes (16 bits) can store an integer value up to 65,535 ($2^{16}-1$), while two bytes of binary coded decimal notation can store an integer only as high as 9,999 using 4 bits for each digit (at two digits per byte), with no means of indicating if this is a positive or negative value. The disadvantage of binary notation is conceptual. We are far less accustomed to binary numbers than to decimal numbers.

Error Detection

Q: The IBM PC is advertised as having parity error detection in its memory. How does it work? Is there any advantage to buying memory advertised as having error correcting circuitry (ECC) and will that work with my PC?

Molly McCrea
Berkeley, California

A: Because the 8088 microprocessor chip uses an 8-bit data length (one byte), the memory that the 8088 connects to needs to have only eight data lines. The IBM PC includes a ninth data bit called the parity bit. The information stored in the parity bit is used by the computer only for detecting memory errors.

This is the way that parity error detection works. When you write a byte of data to memory, the number of 1s in the data is counted. If there is an even number of 1s,

the parity bit at that address is written high (1). If there is an odd number of 1s, the parity bit is written low (0). When the byte is read back from memory, that parity bit is checked. If the state of the parity bit correctly corresponds to the even or odd number of 1s read back from the byte, all is well. If the parity bit and the number of 1s are improperly matched—for example, the byte has an odd number of 1s but the parity bit is high, meaning even—then a parity check error signal is generated. For the present setup, this signal causes your PC to print an error message and then stop working entirely.

Parity error checking cannot detect every kind of memory error. If 2 bits in the data byte are incorrect, then the parity check would not notice the error, because switching the 1s or 0s of 2 bits will return the byte to the correct even or odd state. Because of the way the PC's memory works, the chances of having 2 bits fail simultaneously is very small, so parity checking is still a pretty good error detection method.

Having an error signal stop execution entirely is better than allowing a program to continue to run with incorrect data, but it would be better if the computer could automatically correct the error. There is another method, called error correction, that can do this. By adding a few more bits for checking data, hardware with this feature cannot only detect, but also correct an error in a single bit. When 2 bits go wrong, (something that parity error checking may not even find), error correcting memory can't make the correction, but it can usually produce a signal equivalent to the PC's parity check error signal. By adding more bits of extra memory for checking, you can even correct multiple bit errors. You may expect that as memory prices continue to drop, error correction will become a more common feature. If an error correcting card is advertised as compatible with the PC, then it should work in your computer, with better performance than a standard memory card. /PC

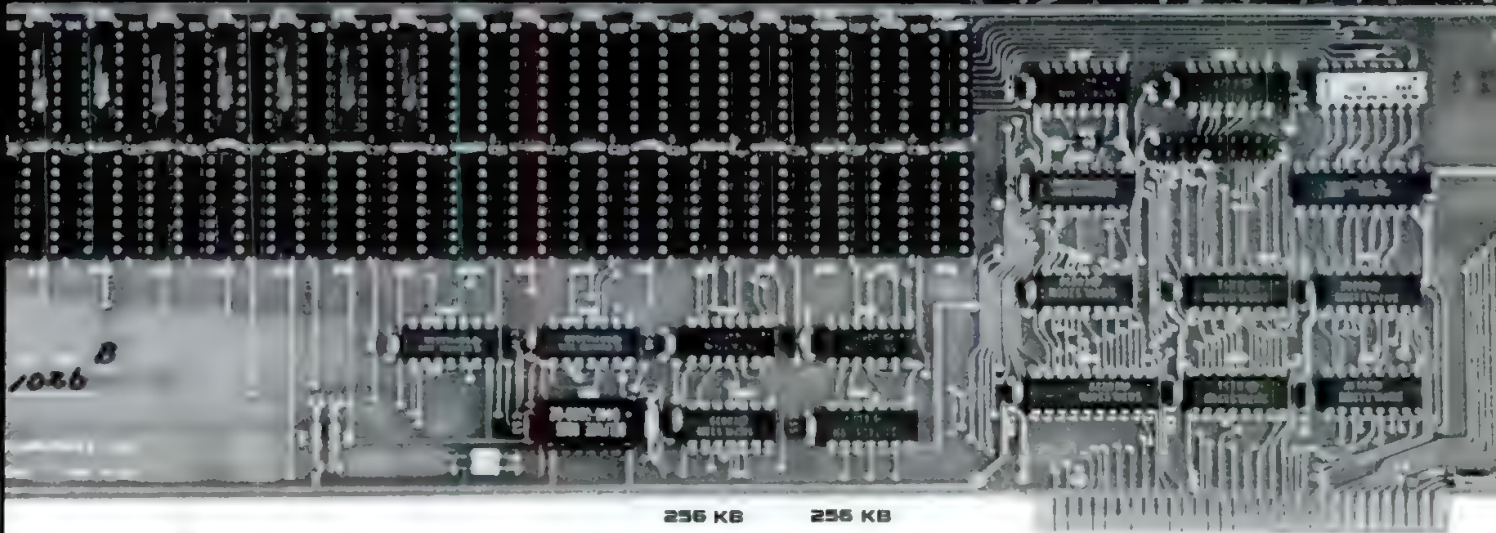
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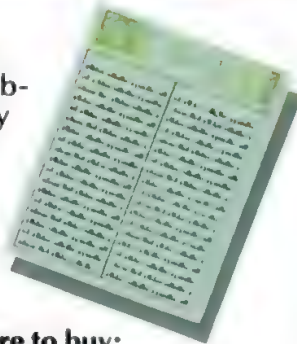
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Electronic Mail: The

The proponents of electronic mail, a technology that promises to deliver the paperless revolution to our homes and offices, estimate that more than 77,000 electronic "mailboxes" are already in use by businesses around the country. One expert predicts that the number of business mailboxes will double to about 200,000 by the end of 1983 and will reach 900,000 by 1986. The number of private electronic mailboxes already runs into the thousands and is expected to grow substantially. The IBM PC is already on the electronic postal route. As part of the research for this story, a piece of electronic copy made its way from a PC in North Carolina via satellite to a PC in New York.

The Future Arrives

Picture for a moment Willy Lowman, Jr., a greeting card salesman on the road in Dubuque. He pulls into a motel at the end of a long day, picks up the room phone, and dials the auto-answer modem hooked into the IBM PC at company headquarters in Duluth. He plugs his portable computer into the line and enters his identifying password.

On the screen of his portable, Willie flips through the stack of messages in his electronic "in-basket." When he types in his replies, some will be transmitted electronically to other salesmen or to managers of the company. Others will be automatically printed out by letter quality printers, stuffed into envelopes, and dispatched to customers via conventional mail the next morning.

Finally, Willy logs his day's orders into the electronic mail system for action by the company's central accounting computer, and then heads for the bar. Willy's father never had it so good.

On a grander scale, imagine a multina-

tional corporation that must send an important announcement to its field offices and factories. The push of the Return key on an IBM PC in Chicago causes the message to appear instantly and simultaneously on the screen of a word processor in New York, the video display of another PC in Dallas, the printout of a Telex in Frankfurt, and the output of a laser printer in Tokyo. The message could go to hundreds of locations at the same instant, or it could be stored for forwarding at an assigned time.

In the home, the PC can become an efficient, uncomplaining 24-hour personal secretary. It could pick up mail from other computers, send out letters, pay bills through a connection to the local bank, order airline tickets, reserve a pair of seats at the ballet, and receive and store for future reference electronic versions of newspapers or magazines.

The advent of electronic mail may signal the end of telephone tag—whereby two callers never connect because one or the other is always out of reach of the telephone. The PC can deliver a memo from desk to desk without either participant having to skip lunch. Efficiency experts claim that by helping business people avoid the telephone, electronic mail will increase office productivity.

The Third Wave

Today's electronic mail systems represent the third wave of electronic mail technology. Users of the first wave of machines remained bound to paper copies. The first electronic mail devices were Telex or TWX machines that linked one typewriter keyboard to another.

That generation also included "telecopiers," those whirring, whining Xeroxes and QWIPs that converted the lines on a





Paperless Revolution

piece of paper into beeps and bleeps on a telephone circuit. At the other end of the line, another telecopier scratched a fuzzy facsimile onto specially coated paper. The effect was somewhat like reading a newspaper through a piece of gauze.

The second electronic mail wave deposited the electronic equivalent of a very long extension cord to connect a computer and printer. Copy was produced on a video screen and then sent over telephone lines to a printer or facsimile reproducer. In the electronic-to-paper era, a document that needed to be worked on at the other end had to be reentered into a computer or retyped on a typewriter.

The third wave of mail technology truly marks the arrival of the paperless revolution. Central computer post offices can store and dispatch messages, transmit files of information automatically, and communicate with other branch post offices and stand-alone microcomputers around the world without ever resorting to hard copies.

Big Business

The Bank of America, headquartered in California, boasts one of the most complex and capable internal electronic mail systems in the world. A large part of this system consists of IBM PCs; B of A had more than 400 PCs by November 1982, and was adding them at a rate of about 150 per month.

Any of the micros or communicating word processors in the system can send or receive messages through one of the bank's 27 mainframe data processing facilities. The bank maintains a private telecommunications network that uses leased Atlantic and Pacific satellite and cable connections.

"I can sit at my PC in San Francisco



and transmit a message in real time to a laser printer in London," one employee said. "Or I can leave it with one of the systems to deliver when I want, or I can broadcast it to any number of people on the network."

The Bank of America's PCs range in capacity from 64K RAM units with floppy disks to supersystems built up to 1 megabyte of internal memory and 80 megabytes of hard disk storage. The communications software is an adaptation of the ubiquitous PC-Talk program.

Personal Mail

PC users interested in electronic mail for their homes or businesses—and the experts predict that sooner or later most of us will be—have several options.

One option is to subscribe to one of the general purpose bulletin boards or network services, such as The Source or CompuServe. These offer storage of messages—subscriber to subscriber. To implement these services with a PC, users need an asynchronous serial port and a modem to link the computer to the phone lines. The communications software needed for these general-purpose networks requires only the simplest of capabilities.

A second option would be to subscribe to one of the specialized electronic mail networks. These systems include Graph-

net's Freedom Network and Tymeshare's OnTyme Electronic Message Network Service. The Freedom Network allows subscribers to tie their IBM PCs or other computers to Telex, International Telex, or TWX terminals around the world; or to any other communicating word processor or computer. The system is designed to eliminate compatibility problems between different systems.

Besides their mail system, which is similar to Freedom Network's, OnTyme offers an on-line electronic filing system. This system works like an on-line data base. A company could use it, for example, to make its up-to-the-minute prices available by phone to salespeople or customers.

GraphNet's communication system is built around something called "packet-

delivery. The message train moves through one network node after another, like a freight train passing through stations, until the destination node is reached. At this point packets are unloaded and delivered to specific addresses, or terminals. The destination node then confirms delivery by reporting back to the originating node.

GraphNet charges subscribers a base fee of \$5 per month plus per message charges that range from 35 cents for every 66 words from an IBM PC to a Telex machine, to 43 cents per 100 words from a PC or other microcomputer to a higher-speed TWX. Least expensive is the rate between two micros that are already on the Freedom Network: 30 cents per 100 words. OnTyme's charges are similar, and its messages travel that company's own packet system, called Tymnet.

The third possibility is to establish your own post office. Consultants sell complete electronic mail systems that include computers, modems, disk storage, and software. Or, you can build a system yourself. For an IBM PC, this requires at least two disk drives and possibly a hard-disk storage system if you want to keep a large amount of information available at all times. It also requires a programmable answer/originate modem and electronic mail software that combines communications and file access.

E-Mail

E-Mail is one electronic mailbox and bulletin board program written specifically for the IBM PC. The program's author is C. Dennis Jones, a Charlotte, North Carolina engineer who wrote the program because of a need in his own business.

"We have clients all over the nation," said Jones. "We needed to transfer specifications, letters, memos, updates, and invoices from the field and from our customers."

Jones' program enables an IBM PC with a minimum of 64K RAM, two floppy disk drives (or a hard disk system), and a programmable modem to serve as an unattended switchboard and mailbox. Users can dial into the system from any computer or communicating word processor to pick up or leave messages or to deposit files.

E-Mail can be instructed to call another computer and send files of informa-

ADVANCES in business applications are likely to result in spinoffs for private users.

switch" technology, which the company compares to a railroad network. According to GraphNet, messages, like freight on a train, start out at specific terminals and are transmitted to an originating node, or train station. At the station, the messages are assembled into packets with other messages, in the same way that a freight train is put together. The packet's destination resides at the head of the packet; on the way to its destination, the packets are switched automatically from line to line to ensure the quickest and most economical

tion at a prearranged time; in fact, two or more electronic mail systems could exchange data back and forth without any user involvement at all. This sort of arrangement allows users to take advantage of the most economical long-distance telephone rates.

TODAY'S electronic mail systems represent the third wave of electronic mail technology.

Jones uses the communications program included in *E-Mail* for an additional purpose in his own office. "We've got a TRS-80 Model 16, a Model 1, and an IBM PC sitting side-by-side in our office. To get them to talk to each other sometimes we just use the phone to call from one to the other," he said.

E-Mail requires the Hayes Smartmodem for its central operations. Later editions might support other modems if there is customer demand. Users calling into the system can use any modem and communications software at their end of the line.

E-Mail includes a full-featured communications program as well as adaptable modules that allow a user to customize the program for specific uses such as a bulletin board, a private electronic mail facility protected by passwords, or a computerized ordering center. *E-Mail* lists for \$250.

Industry Projections

The potential for electronic mail is so big that the sales participants already include the largest corporation in the nation, AT&T, as well as such colossi as IBM, Western Union, and the U.S. Postal Service. Federal Express, which has made a spectacular success with its overnight coast-to-coast package delivery system, has announced plans to enter the facsimile transmission side of the electronic mail business.

When such heavyweights enter the business ring, you can be sure they have some pretty sound financial reasons. The

National Research Council, in a study conducted for the federal government in 1976, estimated that 80 percent of all conventional first class mail is presently shipped by business or government. Of that, about 30 percent—bills, tax statements, price notices, and legal documents—could be converted to all-electronic or electronic-to-paper transmission. A large portion of the remainder may be suitable for electronic-to-electronic systems.

"The reason the growth projections of mailbox use are so astronomical is because electronic mail is just now being discovered," said H. Paris Burstyn, senior analyst for the Yankee Group, a Boston market research firm that specializes in computers and communications. Burstyn follows the electronic mail industry for users and vendors.

"Up until now there have been two drawbacks to the use of electronic mail," Burstyn observed. "One has been that terminals have not been friendly and they have been used only for a single application. Now you can get intelligent terminals and computers like the PC and do a multitude of things. The second reason is that applications have not really been put forth before."

Burstyn said he expects the initial surge in electronic mail use to come from business. He notes that for many corporations, 85 to 95 percent of all communications are in-house. Private mail networks have obvious appeal to such organizations.

The next step will be communications between a company and its customers and suppliers. This will likely require connections between the intra-office system and one or more of the general-purpose communications networks. Advances in business applications are likely to result in spinoffs for private users.

The federal government studied the growing electronic mail industry in search of a role for the U.S. Postal Service. According to Gaylord Freeman, former head of the Presidential Commission on Postal Service, "Our long-range outlook for the Postal Service is dismal."

E-COM

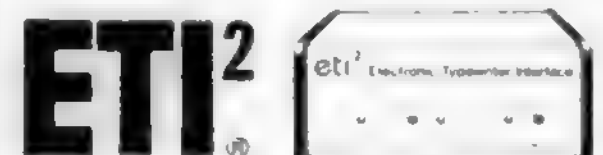
In January 1982, with a sense of pessimism about the future of its primary source of income, the Postal Service established E-COM, a second-generation elec-

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CIRCLE 121 ON READER SERVICE CARD

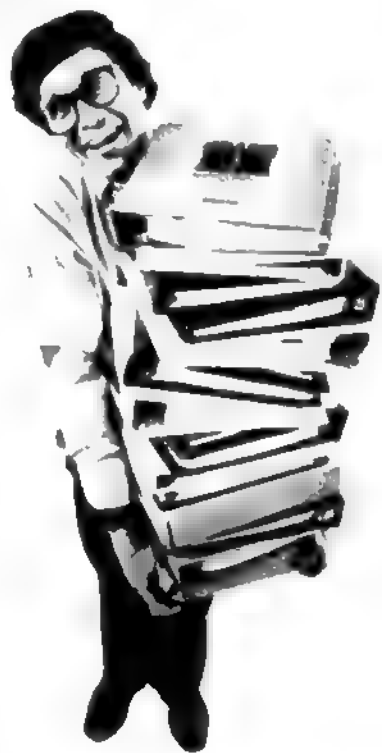
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CIRCLE 425 ON READER SERVICE CARD

tronic mail service aimed at large-volume mail shippers with massive mainframe computers. The service requires a minimum of 200 letters per order.

E-COM guarantees delivery of letters from mainframe computers to any point in the continental United States within 48 hours. The messages are printed out at one

THE EXPERTS
are by no means certain of the full potential of electronic mail.

of 25 stations around the country, inserted into envelopes, and added to the regular stream of first class mail. The price is just slightly higher than ordinary postage; 26 cents for the first page and 5 cents for each additional page. Using E-COM, however, eliminates the expense of paper, printing, and delivery to the shipper.

A number of services, Western Union among them, offers owners of IBM PCs and other microcomputers access to E-COM. Among the services offered by Western Union is something called Access, which brings together telegrams, Telex, TWX, Mailgrams, Cablegrams, E-COM, and a computer letter service.

To use E-COM, Western Union batches together single letters until the pile is large enough to send on to the Postal Service. For uses that don't require overnight service, E-COM is replacing the Western Union/Postal Service Mailgram partnership.

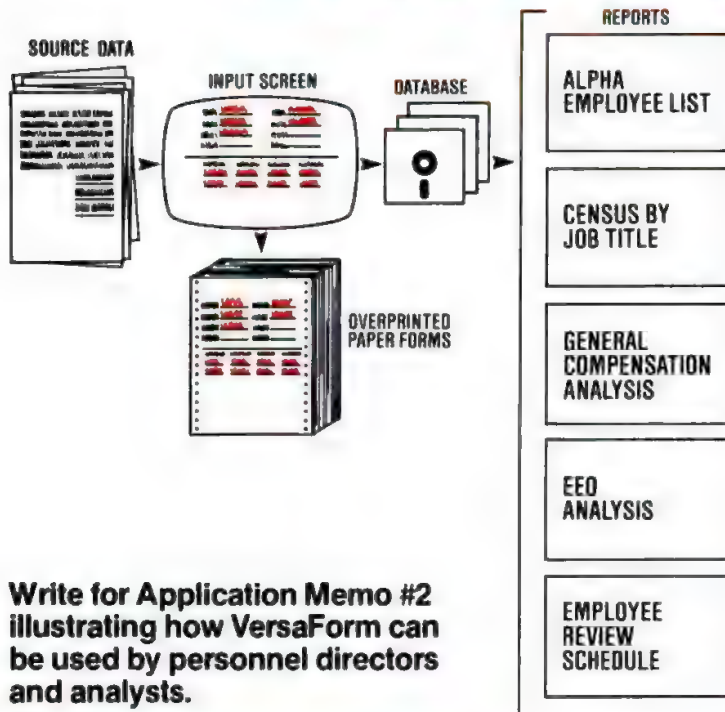
Sending Mailgrams from a terminal costs about 50 percent less than the rate for messages dictated over a telephone to a Western Union operator. The monthly subscription cost for Access is \$10.

On-Line Services

The Source and CompuServe open their memory banks to thousands of subscribers who are charged by the minute for access. Electronic mailboxes are available as part of the ordinary membership in both services. CompuServe maintains a special business mailbox facility. The Source offers connections to Mailgram

BUSINESS FORM PROCESSING

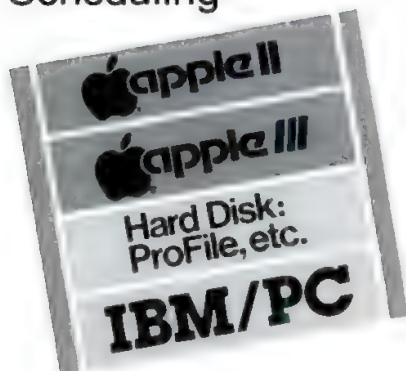
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Write for Application Memo #2 illustrating how VersaForm can be used by personnel directors and analysts.

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Not only can you process forms more quickly, with increased accuracy, and assured completeness, VersaForm has the power to select and summarize data within any or all of the forms on file. The reports represented on the left are just a sample of what it can do.

Taking just minutes to specify and produce a sorted detail report, the results of your query are plain to see . . . on hardcopy or on the screen.

As a business form processor, VersaForm lets you copy a paper form to a 40 or 80 column video screen. Process it error-free. Print the data with precision placement on the original paper form . . . each item in its proper space. And summarize data contained within any group of forms . . . from any number of diskettes or hard disk volumes.

VersaForm is a complete business system combining the functions of database, forms generator, print formatter, tabular calculator and transaction management system. Yet it's easy to use.

Extensive help screens, hands on tutorial manual and work disk, application notes, and the most complete user's guide found anywhere ensure that VersaForm can be immediately applied to your form processing and reporting needs.

Need an Apple III/ProFile DBMS? VersaForm does it. That's because a database record is just another form. Yet, unlike other databases, VersaForm actually simplifies record structures and reporting facilities most often used in 'index card' applications. Function for function, VersaForm is unmatched in its data entry and checking capabilities, ease of use, and comprehensive approach to managing business information. Visit your local computer store.

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and E-COM through links to Western Union.

Dozens of electronic bulletin boards operated by hobbyists, clubs, and computer stores offer postal services for free or for a modest fee. In their early forms, however, these bulletin boards are sometimes limited in storage space and less than perfect in terms of reliability. With this option, one has to be willing to accept the possibility that the owner will be playing PacMan when you want to pick up your mail.

Looking Ahead

The experts are by no means certain of the full potential of electronic mail or its future directions. Many users already route their calls through one of the many private telephone networks such as MCI or SPRINT. Perhaps a next step will be direct microcomputer-to-microcomputer communication using small satellite dishes. Like personal computers, uses for electronic mail are sure to be invented to serve the new tool.

One projected scheme involves a combination of optical character recognition technology and facsimile transmission. A typed document with handwritten comments and drawings could be fed into an OCR reader. Portions of the document could be manipulated in a computer at either end and then merged with the drawings.

Snags and Snafus

Electronic mail involves a number of legal and other issues that have yet to be resolved. For example, one of the critical legal and business functions served by the U.S. Postal Service is certified and registered mail. If electronic mail is to reach full utility, there must be a way for two companies or individuals to sign and witness receipt of mail and approval of contracts.

If electronics are to replace the physical presence of two bargainers at a spot market, there has to be a legally binding record of the electronic handshake that sealed the deal. One solution is to use pre-

arranged codes sent from each computer.

Another issue involves protocol and the pecking order of the office. For decades, managers have prided themselves on their inability to type. The first sign of status for executives is the installation of a secretary outside the door. At least for the foreseeable future—until the arrival of a new technology such as voice recognition—executives may have to learn to let their fingers do the talking.

One problem is very likely to follow the postman wherever he goes: junk mail. Will access to electronic mailboxes be restricted in some way? Or perhaps we'll be able to install a program that reads incoming mail and zaps all letters selling condominiums in Death Valley or announcing that we may have already won...

One final problem may cause fierce resistance from procrastinators and those on shaky financial footing. Electronic mail will make it very difficult to use the time-honored excuse, "the letter's in the mail." In the not-so-distant future, this line will buy only a few milliseconds of stalling time. /PC

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CIRCLE 325 ON READER SERVICE CARD

We are in the middle of humanity's second great information explosion. The first explosion came with the invention of movable type. The second is being fueled by the marriage of computers and communications. Many observers believe that the availability of inexpensive data communications systems will have as

number directories and automatic transmission of codes and passwords. In this issue we will describe some of these programs and provide you with guidelines for program selection.

In order to communicate with the outside world, the PC must have an RS-232C serial port, which requires one of the

COMMUNICATIONS

This issue of PC spreads the word on communications software, modems, and information networks. You can teach your computer to talk with others in an expanding electronic world.

much impact on our culture as the development of the printing press did in the fifteenth century. Sorting, arranging, and transmitting information are the specialty of microcomputers operating as data communications devices.

If you own an IBM PC, you already have the primary element in a communications system: a data communications terminal. It can allow you access to information when and how you want it; transfer programs from one system to another; and bring in news, transportation schedules, research information, and electronic mail at the speed of light.

The software needed to turn the PC into a communications device is referred to as a terminal emulation program. A dumb terminal emulation program allows you to communicate, but all of the transmitted data must be entered through the keyboard. A smart terminal program can save the received data as disk files and transmit disk files out through the communications port. These smart programs have many other features, including automatic telephone

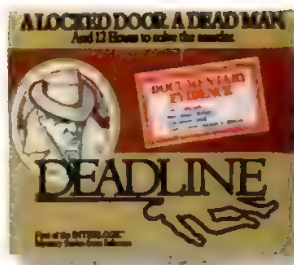
PC's expansion slots. Many companies market combination boards that combine a serial port with other functions. Several boards are reviewed in this issue.

Once a way has been provided for serial data to leave the PC, it must still be connected to the telephone lines. A modem provides this interconnection by converting the electrical output of a computer or terminal into a form that can be transmitted and received over a standard telephone line. We review several modems and provide a chart comparing several popular smart modems.

Current research and development are aimed at making telecommunications less visible. The development of integrated software will certainly lead to fully automatic systems where establishing communications and retrieving information are subfunctions like adding columns of numbers or retrieving a record from a data base. But for now, you still have some decisions to make if you want to communicate. This issue will help you understand how to turn your PC into a modern communications machine.







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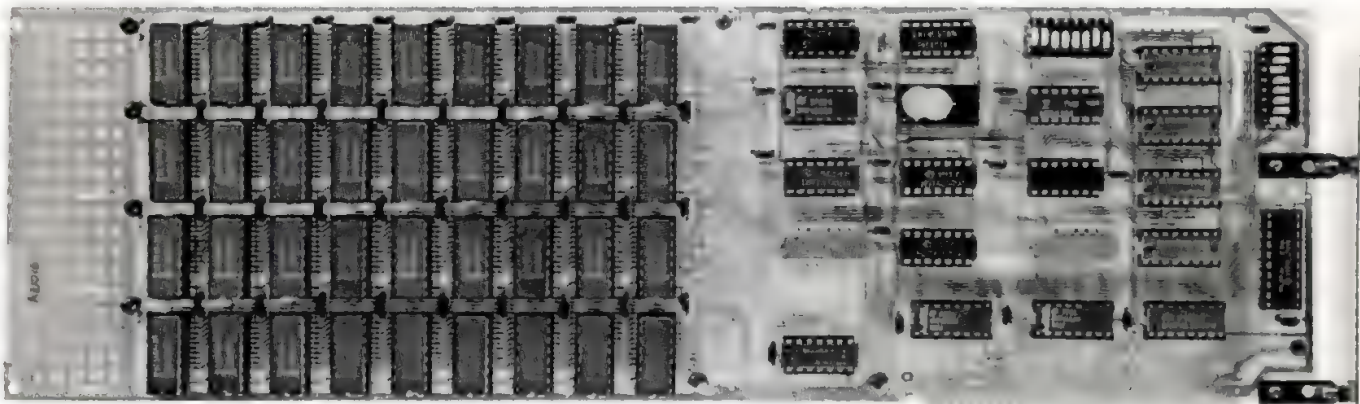
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The PDI 256 provides up to 256K of user memory with parity on a single expansion board for the IBM Personal Computer. Memory is organized as 4-64K memory banks, each bank can be set to any 64K boundary within the 1M address space. Individual memory banks may also be deselected. All address mappings are made by DIP switch settings for easy configuration. All RAM chips are socketed to allow for easy memory add-on or replacement. Memory refresh for PDI series memory boards coincides with the planar board's refresh. No wait-states are required for expansion memory accesses. The PDI 256 is also available in 64K, 128K and 192K versions which are easily upgraded in 64K steps to a maximum capacity of 256K.

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The PDI464 features six separate functions—expansion memory, two asynchronous serial channels, a real-time clock, a disk emulator, and a print spooler. Together with its high quality, the PDI464 offers a price-performance ratio that is tough to beat.

The memory section of the PDI464 provides up to 256KB of fully socketed expansion memory with parity generation and checking. Four memory sizes are available from 64K up to 256KB to meet a variety of needs. Regardless of memory size ordered, each PDI464 is tested with a full compliment of 256KB of memory to ensure trouble-free future expansion. Disk-based memory diagnostics are included which can test memory integrity and report problems down to the chip level.

Two asynchronous serial channels are provided which are completely compatible with IBM serial channels. Each channel can be selected to reside at one of four addresses to allow for future expansion. A unique feature is provided which allows simple selection of data terminal or data communication equipment (DTE/DCE) configurations, thus eliminating the need for special cables or null modems. Each channel has its own connector mounted on the back bracket and comes complete with two 6 foot RS-232 cables.

The Real-Time Clock section features quartz-crystal control and lithium battery back-up to ensure years of trouble-free

operation. The RTC features hours, minutes, seconds, day-of-the-week, date, month, and year with automatic leap year adjustment. Software is provided to initialize system time and date information automatically upon power-up.

p-Disk™, a disk-emulation package provided with the PDI464 allows memory to be treated as an ultra-fast disk drive. p-Disk™ can be configured as a single or double-sided drive and can appear as drive B, C, or D. p-Disk™ does not require modification or patching of the BIOS or DOS files on system diskettes and is fully compatible with IBM software and diagnostics.

A background printer spooler is included with the PDI464 which allows files to be printed on a printer while other software is being used in the foreground. The spooler offers features such as menu-selectable configuration, multiple copies, and automatic file deletion.

Comprehensive documentation is provided with numerous illustrations to simplify installation procedures. All documentation fits neatly into existing 3-ring binders provided with the Personal Computer.

Each PDI464 is "burnt-in" at elevated temperatures and fully tested. Packaging material provides protection from static and mechanical shock during shipment to further ensure reliability. The PDI464 is covered by a one year limited warranty.

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NAME	DESCRIPTION		
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2 ANNU1	Annuity computation program	60 COMBAL	True rate on loan with compensating bal. required
3 DATE	Time between dates	61 DISCBAL	True rate on discounted loan
4 DAYYEAR	Day of year a particular date falls on	62 MERCANAL	Merger analysis computations
5 LEASEINT	Interest rate on lease	63 FINRAT	Financial ratios for a firm
6 BREAKVEN	Breakeven analysis	64 NPV	Net present value of project
7 DEPRSL	Straightline depreciation	65 PRINDLAS	Laspeyres price index
8 DEPRSY	Sum of the digits depreciation	66 PRINDPA	Paasche price index
9 DEPRDB	Declining balance depreciation	67 SEASIND	Constructs seasonal quantity indices for company
10 DEPRDDB	Double declining balance depreciation	68 TIMETR	Time series analysis linear trend
11 TAXDEP	Cash flow vs. depreciation tables	69 TIMEMOV	Time series analysis moving average trend
12 CHECK2	Prints NEBS checks along with daily register	70 FUPRINF	Future price estimation with inflation
13 CHECKBK1	Checkbook maintenance program	71 MAILPAC	Mailing list system
14 MORTGAGE/A	Mortgage amortization table	72 LETWRT	Letter writing system-links with MAILPAC
15 MULTMON	Computes time needed for money to double, triple, etc	73 SORT3	Sorts list of names
16 SALVAGE	Determines salvage value of an investment	74 LABEL1	Shipping label maker
17 RRVARIN	Rate of return on investment with variable inflows	75 LABEL2	Name label maker
18 RRCONST	Rate of return on investment with constant inflows	76 BUSBUD	DOME business bookkeeping system
19 EFFECT	Effective interest rate of a loan	77 TIMECLK	Computes weeks total hours from timeclock info.
20 FVAL	Future value of an investment (compound interest)	78 ACCTPAY	In memory accounts payable system-storage permitted
21 PVAL	Present value of a future amount	79 INVOICE	Generate invoice on screen and print on printer
22 LOANPAY	Amount of payment on a loan	80 INVENT2	In memory inventory control system
23 REGWITH	Equal withdrawals from investment to leave 0 over	81 TELDIR	Computerized telephone directory
24 SIMPDISK	Simple discount analysis	82 TIMUSAN	Time use analysis
25 DATEVAL	Equivalent & nonequivalent dated values for oblig.	83 ASSIGN	Use of assignment algorithm for optimal job assign.
26 ANNUDEF	Present value of deferred annuities	84 ACCTREC	In memory accounts receivable system-storage ok
27 MARKUP	% Markup analysis for items	85 TERMSPAY	Compares 3 methods of repayment of loans
28 SINKFUND	Sinking fund amortization program	86 PAYNET	Computes gross pay required for given net
29 BONDVAL	Value of a bond	87 SELLPR	Computes selling price for given after tax amount
30 DEplete	Depletion analysis	88 ARBCOMP	Arbitrage computations
31 BLACKSH	Black Scholes options analysis	89 DEPRSF	Sinking fund depreciation
32 STOCVAL1	Expected return on stock via discounts dividends	90 UPSZONE	Finds UPS zones from zip code
33 WARVAL	Value of a warrant	91 ENVELOPE	Types envelope including return address
34 BONDVAL2	Value of a bond	92 AUTOEXP	Automobile expense analysis
35 EPSEST	Estimate of future earnings per share for company	93 INSFILE	Insurance policy file
36 BETAALPH	Computes alpha and beta variables for stock	94 PAYROLL2	In memory payroll system
37 SHARPE1	Portfolio selection model-i.e. what stocks to hold	95 DILANAL	Dilution analysis
38 OPTWRITE	Option writing computations	96 LOANAFDD	Loan amount a borrower can afford
39 RTVAL	Value of a right	97 RENTPRCH	Purchase price for rental property
40 EXPVAL	Expected value analysis	98 SALELEAS	Sale-leaseback analysis
41 BAYES	Bayesian decisions	99 RRCONVBD	Investor's rate of return on convertible bond
42 VALPRINF	Value of perfect information	100 PORTVAL9	Stock market portfolio storage-valuation program
43 VALADINF	Value of additional information		
44 UTILITY	Derives utility function		
45 SIMPLEX	Linear programming solution by simplex method		
46 TRANS	Transportation method for linear programming		
47 EOQ	Economic order quantity inventory model		
48 QUEUE1	Single server queueing (waiting line) model		
49 CVP	Cost-volume-profit analysis		
50 CONDPFOT	Conditional profit tables		
51 OPTLOSS	Opportunity loss tables		
52 FQOQ	Fixed quantity economic order quantity model		
53 FQEOWSH	As above but with shortages permitted		
54 FQEOQPB	As above but with quantity price breaks		
55 QUEUECB	Cost-benefit waiting line analysis		
56 NCFANAL	Net cash-flow analysis for simple investment		
57 PROFIND	Profitability index of a project		
58 CAPI	Cap. Asset Pr. Model analysis of project		

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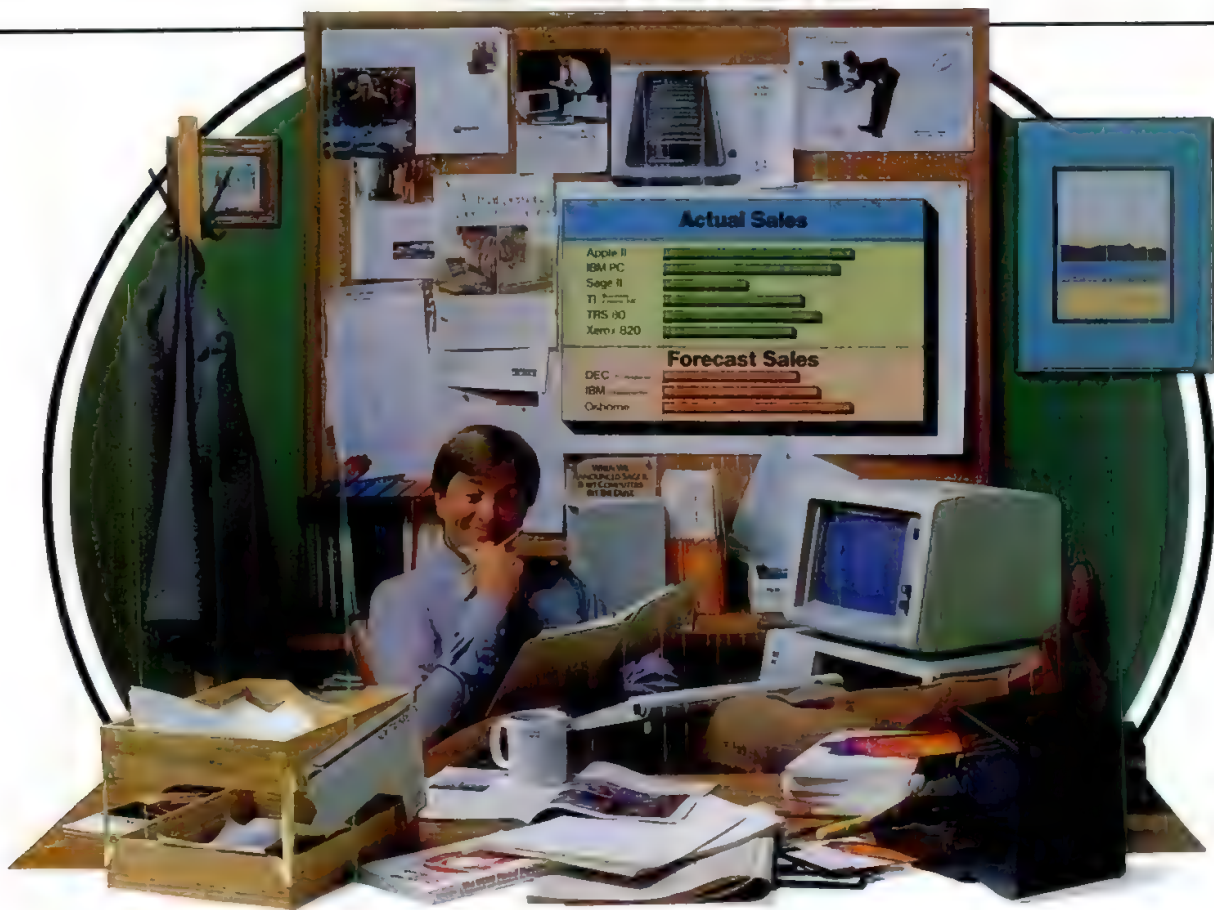
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Telecommunications Past, Present, And Future

Present trends favor digital communication between computers, but history reveals that analog communications may already be planning a comeback.

Data processing refers to the conversion of raw data to a form that can be read by computers. The word *telecommunications* derives from the Greek *tele*, meaning "far off." So, strictly speaking, *telecommunications* means "communication at a distance." In contemporary usage, however, *telecommunications* suggests wires, elec-

trically charged signals, and wavelengths.

During the past few years, telecommunications and data processing technologies have been converging. Distinctions between pure data processing and pure telecommunications can no longer be drawn. Understanding this development requires an examination of both comput-

ers and the history of telecommunications.

The connection between computers and communications is as important to our time as the development of the telegraph, telephone, and radio were to other eras. Financial transactions and exchanges of information now depend on data processing and telecommunications. As life grows





more complex, the need for automation grows—and that need must be met.

Starting with History

A century ago there were 12 units of electromotive force, ten units of electric current, and 15 units of resistance. The first International Electrical Congress, held in Paris in 1881, in effect adopted Ohm's Law, fixing the relationship of what we now call the ohm to the volt and the ampere.

Even before that—30 years earlier—the International Telegraphic Union was helping fiercely nationalistic European countries build mutually compatible telegraph systems. By 1868, with the Telegraphic Union's help, the United States and Great Britain laid the first transatlantic cable. Today the organization is called the International Telecommunications Union to reflect the growth of telephony, radio, television, and satellite technologies. Now part of the U.N., it is the oldest continuous international deliberative body in the world.

In 1858 telegraph clerks used a recently developed technique called shorthand to transcribe the Lincoln-Douglas debates for transmission to newspapers in different parts of the country. Although Lincoln lost the Senate election in Illinois, he gained nationwide attention. In 1861 the first transcontinental telegraph line in North America required fewer than 4

months to be built. The pony express went out of business before the end of the decade. By 1877 Alexander Graham Bell and Thomas Watson were shouting "Ahoy! Ahoy!" through their new invention, the telephone, in public demonstrations. By the turn of the century the novelty had become a necessity.

Just when it seemed that telegraph and telephone wires were about to choke every major city, Guglielmo Marconi perfected wireless telegraphy. In 1906 wireless operators on ships at sea thought they heard the heavenly host over their earphones, but it turned out to be Reginald Fessenden playing the violin in what was probably the first radio program ever. In New York David Sarnoff was a teenage telegrapher for a department store until the night he relayed the *Titanic's* SOS to the public. Not too much later, he became president of RCA and practically invented commercial radio and television as we know them today.

New Channels to Cross

Understanding telecommunications is not difficult since so much of what seems new is based on what is already accepted. The telephone system, for example, is based on analog transmission. The term *analog* refers to a one-to-one representation of something by something else, as the movement of mercury in a tube represents the fluctuation of heat around it. The

groove on a phonograph record makes the needle undulate to produce sound analogous to what was recorded. Telephones make an analogy between the sound waves produced by a voice and the flow of current through the line.

When two ships signal each other by flashing lamps on and off in Morse code, they are using digital communication in its simplest form. Neither the light itself nor its duration or intensity is analogous to the information; the signals must be interpreted by a code agreed upon by the sender and receiver (in this case, Samuel F. B. Morse's code).

In the same way, computers signal one another over wires by trading on and off pulses of electricity thousands of times a second. Unfortunately, telephone lines are not inherently suitable for digital signals because they were designed to carry voice. To solve this problem, Bell Laboratories developed a machine that modulates data into analog signals for transmission over phone lines and demodulates those signals back into digital form at the other end. Their modulator-demodulator is called a modem.

If several computers are on a phone line, each can have a unique "address" so that messages intended for a given computer will be read by that computer only. The digital information received by the computer need not be restricted to printed data; it may include voices, television pictures, facsimiles—anything that can be electronically encoded.

When modems were first introduced during the 1960s, they enabled distant users to communicate with centralized computers. By the end of the 1970s, however, the economics of computer technology favored decentralization. The cost of computing power fell to a mere pittance, and small computers competed easily with big ones in performing routine tasks. The pendulum swung so far that many large companies placed microcomputers on people's desks for financial analysis, word processing, and electronic mail—functions that had previously been possible through time-sharing on a large computer only.

But this created a problem: the new computers were much smarter than the dumb terminals. People who needed to share time on a large computer often had to have two machines on their desks. An-

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other problem with early time-sharing systems arose when the central computer was located more than a few thousand feet from the user's terminal. Signals can be amplified only so much before they get distorted, and ordinary wires are fairly "noisy," so the information they carry can easily become garbled.

Smart and Dumb Terminals

Two solutions have emerged. One is to load in software that fools the smart little

THE NEW computers were much smarter than the dumb terminals.

computer into thinking it's a dumb terminal at least long enough to complete any transaction with a remote computer. This pseudotransformation of a computer to a dumb terminal is called terminal emulation. The other solution is to make modems small and cheap enough so that practically every computer user can dial into the telephone network.

Terminal emulation can be built into computer circuits, but it is more commonly done with software. As each key is pressed, its letter, number, or function is translated into a standard code. The American Standard Code for Information Interchange (ASCII, pronounced as-key) is the most widely used code. The ASCII signals are sent out of the computer through a port (the RS-232C serial port). A modem plugged into that port converts the data to analog signals and sends them out over the phone lines. When it detects incoming signals, it demodulates them back into digital data, sends them through the port, and the computer displays the appropriate letter or number on the screen.

In terminal mode, the computer does not generally interpret the data in any way; it just passes it along to the screen. At times, however, the user may want the computer to do something such as save the incoming data on a disk, manipulate it, or format it before displaying it on the screen. Good communications software allows this kind of flexibility, making the

computer into a smart terminal instead of a dumb one.

The modem is connected to the telephone line in one of two ways. Acoustic-coupled modems have rubber sockets into which the telephone handset is placed. There is a microphone at the listening end of the modem and a small loudspeaker at the talking end. If you put your ear close to the speaker, you will hear a high-pitched whine. This whine is made up of two frequencies that indicate whether a computer data bit for 1 or 0 is being transmitted. Direct-connect modems plug into the telephone jack on the wall and convert data directly into analog signals. Direct-connect modems are less susceptible to ambient noise but are typically more expensive than acoustic-coupled modems.

Hooking up to remote computers gives users access to a wide range of services such as bulletin boards, stock market services, and library searches. But many personal computer users enjoy direct communication with their friends and colleagues who have comparable machines. Direct communication between computers over the phone lines requires a modem and terminal emulation software.

Alternatives to Ma Bell

Some alternatives to the phone system are worth considering. These options are

UNFORTU- nately, telephone lines are not inherently suitable for digital signals.

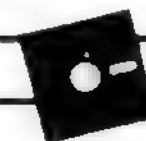
cheaper, or at least no more expensive, than the phone company, but they require a modem. Ham radio operators have for many years sent computer data over radio frequencies reserved for that purpose and have even bounced some of those signals off their OSCAR satellite. People who subscribe to Sprint, MCI, or the other non-AT&T long-distance telephone services can use these services to exchange computer data, although noise on the line can be a problem.

Alexander Graham Bell, incidentally,

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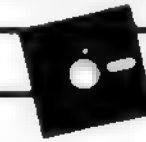
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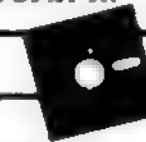
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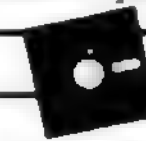
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understood that his telephone was limited in that it carried only a single conversation. He tried to perfect a multiplexing machine that could mix several voice channels into one using pulses of light instead of electricity, but the technology of the period could not meet his expectations. During the 1960s, Bell Laboratories succeeded in transmitting hundreds of voices simultaneously by laser light. Cables made of optical glass fibers can now carry more voice channels than even the purest copper wires.

Private alternatives to the phone system also exist. Some companies have in-

stalled infrared transmission devices between adjacent buildings to carry voice and data. The Federal Communications Commission does not require a license for operating in the infrared or visible light bands of the electromagnetic spectrum. For a few thousand dollars a month a business can lease time on a satellite circuit; many companies that use remote terminals rely on this technology, as do computerized conference-callers and other people who have to share sizable amounts of data daily.

For most microcomputer users, however, the most cost-effective method of trans-

mitting or receiving data is still via the phone lines through a modem. The speed of sending data through an analog phone line is limited by the speed of the modem and by the capacity of the line itself. Mo-

THE MOST cost-effective method of transmitting or receiving data is still via the phone lines through a modem.

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demands sold for personal computers generally pass 300 bits per second (bps). Modems that transmit 1200 bps, once available to industrial users only, are now made for micros as well. While faster modems offer certain advantages, they are more expensive and often cost more to use since remote computers charge more per unit of time for transmitting at faster rates.

The maximum throughput of a modem is 9600 bps. Consequently, many professionals use all-digital circuits that transmit several million bps. Naturally, they cost more to build and use. New satellite services such as SBS and a few conditioned lines from the Bell System are available for this purpose. They are used for data, of course, but also to transmit analog signals such as television pictures, facsimile, and voice more efficiently.

Analog to Digital to Analog

As the microcomputer gains ascendancy, the first forms of electronic communication, digitally encoded signals, are on the rise. In spite of this growing digital trend, analog systems may ultimately prevail. Biochemical and genetic engineering could lead to organic computers whose decision-making abilities would be based on more subtle and variable commands than simple on or off signals.

So far, organic computers (such as the human brain) exist only in nature and not in the laboratory. But who knows? In the great tradition of invention and discovery, some personal computer user tinkering away in a workshop may be on to something that will kick off a whole new analog era in computer technology. /PC

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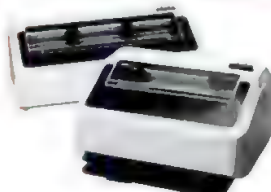


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A woman with blonde hair styled in a bun, wearing a black, backless, knee-length dress and black high-heeled sandals, is shown from the back. She is holding a single red rose with both hands. To her left, a man in a tuxedo and a black glove is holding the stem of the rose. The background is plain white.

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The ASCII Agreement

An introduction to the codes and methods that allow your PC to talk to other computers.

A great deal of mystery still surrounds the subject of computer data communications. Much of the problem stems from the historical origins of data communications systems—the Morkum and Kleinschmidt machines of the 1920s, the TWX service of the 1930s, the RATT and SCRT services of World War II. All of these had some influence on the procedures and terminology in today's data communications.

A comprehensive explanation of data communications would require the equivalent word count of both volumes of *War and Peace*. Consequently, this article limits itself to general information about how the IBM PC communicates with the out-



X is 1011000

Y is 1011001

Z is 1011010.

Useful nonprinting characters are also included in the ASCII code. For example, the bell or beep action is 0000111, and the carriage return is represented by 0001101.

True ASCII consists of only seven bits, but by adding one bit to standard ASCII, IBM doubled the number of codes and permitted a greater number of symbols to be represented on the PC. There are 128 standard ASCII codes and 128 additional ASCII codes on the PC. IBM assigned the extra codes to foreign characters, graphic symbols, and special symbols like the ace of spades. A complete list of the PC-extended ASCII codes is given in Table 11 of the *IBM Technical Reference Manual* and in Appendix G of the *BASIC Manual*.

The advantage of more symbols on the PC resulting from IBM's use of the eighth bit outweighs the disadvantage of being slightly nonstandard compared to other computer systems. The nonstandard effects occur mainly in the exchange of graphics and word processing data be-

THE FACT THAT ASCII is still useful after 15 years is a credit to the foresight of its designers.

side world. Topics include the codes used to assure accuracy, methods used to transmit them, hardware, and interfacing of the computer to the telephone line—enough to provide a fairly good grasp of the basic concepts.

The ASCII Communications Code

Codes are an integral if not often apparent part of daily life. They vary in familiarity, complexity, and context. The alphabet, Arabic and Roman numerals, and the red-yellow-green traffic light are all codes. Morse is a code consisting of single

tones of short (dots) and long (dashes) duration. The letter X in Morse is represented by the tone sequence "long, short, short, long" (or - . . -).

Since its adoption in 1968, ASCII (pronounced AS-key), which stands for American Standard Code for Information Interchange, has become fairly well-accepted as a world standard computer and communications code. The fact that ASCII is still useful after 15 years of rapid change in the hardware and software environment is a credit to the foresight of its designers. The ASCII code uses the binary numbering system to represent alphabetic, numeric, and other information. Large numbers are designated by combinations of ones and zeros (called bits) rather than the digits 0 through 9. The ones and zeros represent the ON and OFF settings of a switch. They can therefore be transmitted as the presence or absence of an electronic signal or as high or low tones. For example, the following letters are identified by the accompanying ASCII codes:



tween the PC and other computers. For these exchanges, only the seven-bit codes should be transmitted. The eight-bit code should be considered the special province of the PC.

Since the ASCII code is made up of seven zeros and ones, 128 different combinations can be formed. Starting from

0 (0000000)

1 (0000001)

2 (0000010)

3 (0000011)

and continuing through

124 (1111100)

125 (1111101)

126 (1111110)

127 (1111111).

Each code represents a specific symbol or action. (Refer to Table 11 in the PC Technical Reference Manual.)

To display any of the codes on a PC monitor, call up BASIC and type the direct statement: `PRINT CHR$(N)` where N is the ASCII code to be displayed. For example, `PRINT CHR$(83)` will display an S, the equivalent of 1010011 in binary.

`PRINT CHR$(7)` will issue a beep from the PC speaker (7 in the decimal number system is the equivalent of the binary ASCII code 0000111).

To display all of the ASCII codes used by the PC, type:

`10 FOR I = 0 TO 255`

`20 PRINT CHR$(I):`

`30 NEXT I`

`RUN`

Almost any ASCII character can be printed on a PC screen from DOS by hold-

ing down the Alt key and typing 88 on the keypad will print the capital letter X.

Asynchronous Transmission

Asynchronous transmission means transmitting individual ASCII characters with arbitrary spacing between characters. You can send one character, wait for a while, and then send another. The receiver treats each character as a separate entity. Each character consists of one start bit, seven data bits, one parity bit, and one stop bit. These bits are sent as one complete information unit. Characters may be transmitted at any speed within the limits of the data communications link.

Asynchronous transmission comes in two varieties, serial and parallel. In serial mode, each bit is transmitted separately—first the start bit, then the seven data bits, etc. In parallel data transfer, eight bits are transmitted simultaneously over eight separate wires. Since parallel transfer transmits all eight bits at once, it offers the advantage of greater speed. Serial transfer,

THE EIGHT-BIT code should be considered the special province of the PC.

ing down the Alt key and typing the decimal notation for the character on the numeric keypad and then releasing the Alt

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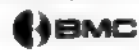
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however, requires less complicated cables. A serial communications cable can consist of as few as two or three wires. Parallel asynchronous data transfer often requires as many as 15 conductors for data and control signals. A good example is the parallel interface used with the PC printer. The mode of transmission over phone lines must be serial and not parallel.

The alternative to asynchronous transmission is synchronous transmission. This is not common on microcomputers. Larger computers talk among each other and to their peripherals via synchronous methods. When a microcomputer talks to a mainframe, it usually communicates through a special asynchronous port on the mainframe.

Full and Half Duplex

There are two types of duplex: half and full. Duplex is best explained by example. Full duplex is analogous to ordinary telephone conversation; both parties can talk and listen simultaneously. Half duplex is

sure a reliable check on the integrity of transmitted data.

The half duplex mode doesn't provide any means of ascertaining which character the remote computer actually received. Striking an A will immediately present an A on the screen, but the character has traveled only from the keyboard to the screen through the PC. It has never passed through the modem or phone lines. Modems are the devices responsible for converting computer data to signals for transmission over phone lines and re-converting the signals to data upon receipt by the computer.

Transmission Speed Rates

As stated earlier, ASCII code is made up of zeros and ones. If a data communications system is capable of sending 300 zeros or ones (low tones or high tones) per second, it is said to be communicating at 300 baud (pronounced "bawd"). The speed used for communicating with the PC is limited by the quality of the phone line and by the speed of the modems attached to the PC.

At this time, the most commonly used transmission speed is 300 baud. This will change shortly as 1200 baud modems begin dropping in price. The implementation of 1200 baud will require a new generation of communications software written in assembly language rather than in BASIC. This is because assembly executes programs more quickly than BASIC. Twelve hundred baud will generally prevail as the maximum transmission speed until more sophisticated modems and better phone lines become available.

Baud rate can be converted to characters per second (cps), a more meaningful measure, by dividing the baud rate by ten. This rule of thumb arises because an asynchronous character is made up of a total of about ten bits. Thus, 300 baud is the equivalent of about 30 cps, 1200 baud about 120 cps.

Modems and Phone Lines

Telephone lines transmit only audible tones. Any computer data sent over phone lines must be converted into sound. Conversely, audible tones coming in over the phone line must be converted into electronic pulses that the PC asynchronous interface can understand and process. The process of converting electronic impulses

NEARLY ALL micro- and minicomputer data communications now take place in full duplex mode.

analogous to CB radio; the parties must alternate talking and listening.

Nearly all micro- and minicomputer data communications now take place in full duplex mode. This offers a distinct advantage. For example, when the letter A is typed on the keyboard of a PC connected to some remote time-sharing service such as Tymnet or Telenet, it travels over the phone line to the time-sharing main computer. The computer receives the A and echoes it back over the same phone line to the PC. If no interference occurs during the transmission, the A appears on the screen. If interference occurs, the results are unpredictable. Most likely, the screen will display some random character. Using full duplex and parity generally as-

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(ones and zeros) into tones (high and low) is called modulation and the reverse process is called demodulation. Hence the word "modem."

If you could tap into a phone line and listen to data communications in slow motion, you would hear a two-note tune. The letter X with the ASCII code 1011000 would sound like (read from right to left) low low low high high low high. Since the tones are actually sent during an interval that might last only 1/30 of a second, they come out sounding like a short warble. The PC "hears" fast enough to understand this warble.

Even or Odd Bit Parity

Adding even or odd bit parity is a method of detecting errors that occur during data transmission. Sending an ASCII character with even parity means that the character must contain an even number of ones, while an odd parity signifies that each character must contain an odd number of ones. For example, the letter X has the bit pattern 1011000. The letter Y has

the bit pattern 1011001. X is composed of an odd number of ones (three), and Y is composed of an even number of ones

EARLY computer systems were incapable of generating and detecting parity bits.

(four). To add parity a zero or one is added to the left of each bit pattern. While the choice of odd or even parity is arbitrary, even parity is the more conventional choice. In adding even parity to the above letters, X with its three ones adds a fourth one to become 11011000; Y with its four ones adds a zero to retain its even number of ones and becomes 01011001.

The benefit of adding the parity bit is that should the character encounter inter-

ference along its transmission path, there is a high probability that its parity will come out incorrectly upon reception. For example, if a two is sent, and the two is garbled into a nine, a character such as ! will appear on the screen, alerting the user to the error.

To complete the ASCII character, one start bit (a zero) and one stop bit (also a zero) are appended to the beginning and end of the bit pattern. Certain older systems required two stop bits to establish synchronization of characters. The use of two stop bits actually wastes transmission time. One stop bit is sufficient and is the current standard.

Early computer systems were incapable of generating and detecting parity bits. Many bulletin boards still ignore the information content of the parity bit. The IBM PC asynchronous communications interface is fully capable of making use of parity. Any high quality PC communications software should make full use of ASCII's parity features.

Asynchronous Communications Interface

Besides a modem, one other accessory is needed to enable a PC to communicate with the outside world. The asynchronous communications interface is an inexpensive add-on board for the PC. It converts internal computer data into asynchronous serial form. The characteristics of the IBM version of this board can be controlled by software. It has a wide speed range (50 to 9600 baud) and a rich variety of features that well-written programs can implement. The board can be used to connect a PC not only to a modem but also to many other devices, such as printers and voice synthesizers. Several manufacturers make versions of the IBM PC asynchronous communications interface. Any non-IBM versions should be checked for full compatibility.

The ASCII code is a hardy standard that for 15 years has proved its ability to carry information and instructions through nearly all available computers, transmission lines, and modems. The codes themselves usually are so conveniently invisible while communicating that users rarely are reminded of how much thanks they owe to these ones and zeros, and to the designers of the ASCII system.

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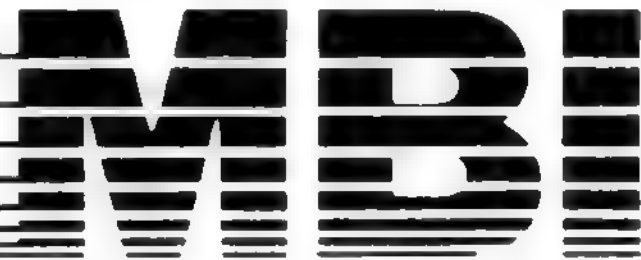
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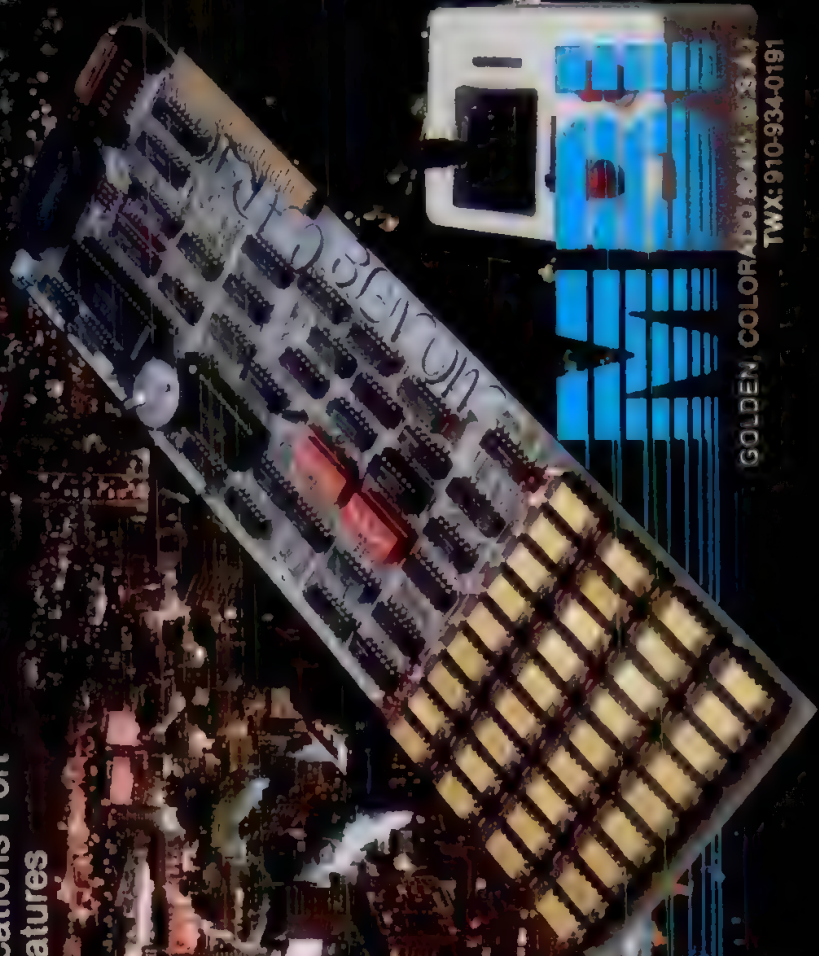
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All About Asynchronous Communications Software

Asynchronous communications programs for the PC are not created equally. The right program for you depends on what you want it to do.

Communications software for the PC range from the Moped-like packages that convert the PC into a dumb terminal to the Rolls Royce versions that program the PC to operate unattended and talk with virtually any other computer on the planet.

Since an array of communications packages is already available for the PC, you should carefully evaluate any program before purchasing it. But first, you should ascertain your specific communications applications. If you are an engineer, for example, you might want to communicate with a large central computer to use its structural analysis program. If you are a stock market investor, you may want to search a computerized database such as Dow Jones News/Retrieval service or CompuServe for financial information. Perhaps your business has branch offices across the country and you need to transmit memos and payroll information at night. Or you're a computer hobbyist who likes to share programs with other PC users.

When communicating with Source, Dialog, or other information services, the PC need only operate as a dumb terminal—one that consists of a keyboard and a

video display screen. The most elementary communications programs provide the PC with this capability. In fact, a simple terminal emulation program is included on the BASIC disk that comes with the PC.

A SIMPLE terminal emulation program is included on the BASIC disk that comes with the PC.

If you want the PC to print out data from another computer or from an information service, you need a program that can do much more than convert the PC to a dumb terminal. If you want your PC to talk with different kinds of computers, to transfer files, or to communicate with other computers at night without an operator,

you need an even more sophisticated program.

If you have determined how your PC is going to be used, then it's time to ask essential questions about the convenience of basic operations, such as configuring the communications program, dialing a remote computer, and logging on.

Program Compatibility

Most computers can transmit data over ordinary phone lines, but depending on the type of computer and the type of software, computers can send electrical impulses at different speeds (baud rates) or in various groupings (character formats). Computers can adopt more than a dozen other communications options, such as how to send a busy signal (handshaking).

The variety of options requires attention to compatibility. Your PC must be configured for compatibility with the system with which it communicates. These are some of the protocols that must be agreed upon by sender and receiver:

- transmission rate
- parity checking
- number of data bits

- number of stop bits
- handshaking
- buffering
- remote echoing
- handling of carriage returns and line feeds

If you plan to communicate with only one other computer, the software need only be compatible with that one system. However, if you use several systems, be sure that it works with all of them.

Answering these questions every time you telecommunicate can be inconvenient. A well-written program can assist you by providing default answers to the protocol questions, so that you only have to change the ones that are different. If a package operates this way, you should also be able to change the default answers easily.

Certain communications programs of-

fer other conveniences, primarily the ability to reconfigure your system without disconnecting it from the remote computer. This feature is useful when you do not know what protocol a remote system uses

COMMUNICATIONS programs can *print transmitted data, received data, or both.*

and it must be determined by trial and error. The ability to display current settings of the various configuration param-

eters is helpful when you are searching for the correct combination.

The least sophisticated communications packages offer no help with dialing; however, most packages are designed to provide some assistance. One dialing aid is an on-line phone directory, which displays the phone numbers and even the account and password information of the computer systems that you call. Without an on-line phone directory, some PC users might find themselves writing phone numbers on scattered sheets of paper or the backs of old envelopes.

If your PC has an auto-dial modem, the communications program can do the dialing and then inform you when a connection has been established (assuming that the modem is compatible with the phone service). If you dial through a switchboard or use an alternative carrier such as Sprint or MCI, be sure that the program and mo-



dem can handle the extra numbers. When a busy signal is obtained, some programs also redial a number automatically, usually after a predetermined wait.

Once a phone connection is established, you have to log on to the remote computer. If your PC is communicating with a network of computers, you may have to connect to a specified remote computer before logging on. You may also have to issue commands to tell the other computer what sort of terminal you are using. Some communications packages enable you to store the commands and passwords for making connections and logging on to the remote systems. With a well-designed communications program, you can select a single menu entry to dial and log on to the other computer system.

You may want to transmit more than connect and log-on information automatically. For example, whenever I log on to one of the university computers where I

cations programs cannot accommodate this format. If an eighth bit is present, they require that it be a parity bit rather than a permanent bit.

All communications programs that run on the PC work with ASCII (7-bit) characters, but you might need to transmit and receive 8-bit bytes in order to transfer machine language programs or transmit documents produced by a word processor that uses the eighth bit for control information. Some programs can be configured to handle 8-bit characters directly, but you must still make sure that the remote system can be configured similarly. If the remote system cannot process 8-bit characters, some packages offer a means of converting them to two 4-bit characters before transmitting them. This approach works, but it doubles the transmission time.

Special and Control Characters

All programs handle codes for the 95 printed characters of the PC and common symbols like &, @, and % in much the same manner: They are displayed when received and transmitted when typed. However, no standard method has been developed to handle the remaining non-printing codes, those that correspond to special and control characters.

Some programs ignore most of the control characters upon receipt, while others display abbreviations on the screen. The most convenient programs let you see the control characters while you are debugging the system, and turn them off during normal operation.

To communicate with several computers, you often have to transmit special control codes. The Ctl=C (ASCII code number 3), for example, is commonly used as an instruction to stop running a program. Many time-sharing systems use Esc (ASCII code number 27) for a variety of control functions. Another frequently used communications signal, the break, is not even part of the ASCII character set. A break consists of about 0.1 second of steady zeros on the line. Many remote systems expect break signals for control operations, so make sure that your communications program can transmit a break, as well as all of the necessary control codes.

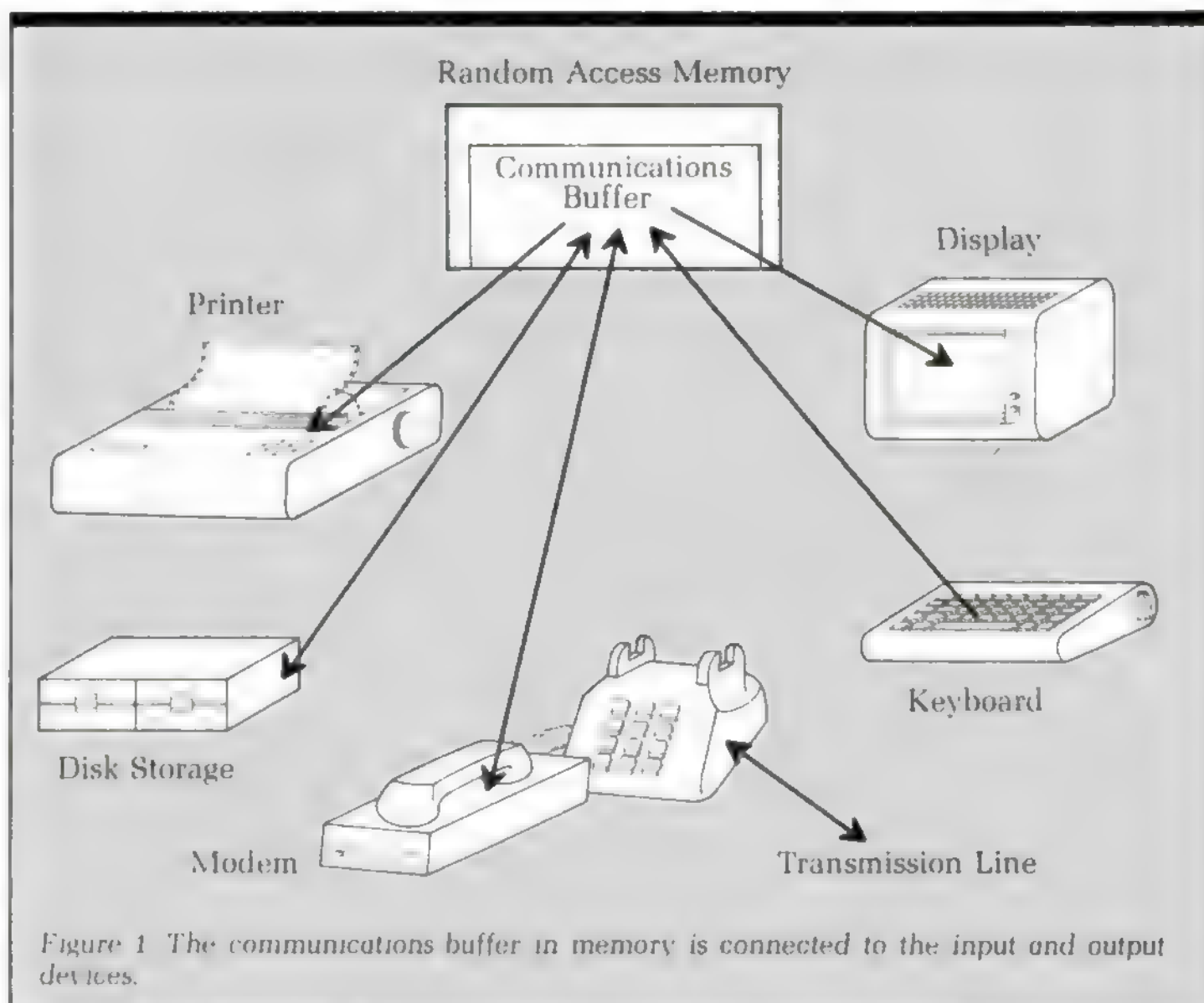
At times you may want to ignore certain incoming codes. For example, some computer systems transmit a few nulls at the end of each line in order to give a printing terminal time to execute a carriage return. However, you may want the PC to ignore the nulls. Many communications programs enable you to specify that certain incoming codes be ignored. The best ones

NEARLY ALL communications programs provide some capability for transmitting a disk file to another computer.

have an account, I run an electronic mail program to display the titles of my unseen messages. This takes several commands, so it helps to have a program that requires only a single keystroke to issue the command. Many communications packages offer this capability by associating a predetermined string of commands with a function key.

Character Format

Most communications packages provide for the common data transmission rates (110, 300, or 1200 baud), but some have trouble handling certain combinations of parity settings or the number of bits in a character. For example, I frequently use a Prime computer that transmits 8 data bits per character, with the high order bit always set "on." Some communi-



allow you to set up a table that specifies how each of the 256 possible incoming codes will be handled.

Likewise, some programs allow you to create a table that specifies translation of the 256 codes before they are transmitted. These packages enable you to communicate with remote computers that do not use the ASCII codes, such as IBM systems that use the EBCDIC coding convention.

Logging Communications

Most communications programs can print transmitted data, received data, or both. Good communications software should also make it easy to turn printing on and off, so that you can omit printing items such as log-on messages and other system control dialog.

The best communications programs can capture the information in a buffer in memory and then print data from that buffer (see Figure 1). The buffer feature can solve timing problems that would arise if an incoming stream of data was fed directly to a printer. Transmission of data would have to pause whenever the printer needed to execute a carriage return or to advance the next page of paper.

A printed transcript of your communications may be handy, but capturing the information on disk is even more useful. This capability allows you to analyze the file at your leisure after your PC has received information from another computer. Since the data is stored in a file on disk, it can also be processed by other programs, such as a data base or word processing program.

As with the printer, the most versatile programs allow you to turn the disk-writing function off and on. This allows you to capture only the interesting material. Some packages also offer the option of writing to disk only incoming or outgoing data.

Handshaking Options

A mechanism must be established that enables either computer to tell if the other one is temporarily busy. The most common convention is called X-ON/X-OFF. This simply means that when the PC wants the remote system to pause, it transmits an X-OFF code (a 19). When it is ready to continue communications, it lets the remote system know by transmitting an X-ON code (a 17).

For example, if the printer runs out of

paper, some programs send an X-OFF to the remote system, pick up the few characters that might straggle in after the X-OFF was sent, and let the operator know that paper is needed—all automatically. Once the paper is inserted, an X-ON is sent to the remote computer and transmission resumes. This capability is often needed when the memory buffer fills up and information needs to be written to the disk.

M_{ANY} *communications programs enable you to specify that certain incoming codes be ignored.*

If every computer system used this handshaking convention, the world would be a happier place. Unfortunately, some systems don't acknowledge each other in the same manner. If you always communicate with the same remote system, you only need to be sure that that system uses the same handshaking method as your communications package. If you communicate with several systems, you may need a program that offers choices. Most programs offer several alternatives (X-ON/X-OFF, break/return, one-line-at-a-time). Some even allow you to write your own handshaking routines.

Disk Buffer and Files

With many communications packages, you can examine the information in the communications buffer during transmission, check the remaining capacity of the buffer, write the data to the disk even though the buffer might not yet be full, clear the buffer, or even edit the information in it. This manual control can be especially useful if the program is not compatible with the remote system's handshaking.

Nearly all communications programs provide some capability for transmitting a disk file to another computer. The file may be any of a variety of types: it may contain accounting data produced by a general ledger program, or a list of all the orders that a branch office received during the

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day, or a proposal written with a word processing program. Some of the simpler communications packages require that the file already be on a disk before the communications session begins.

Program Editing

What if you plan to use your system for electronic mail or for teleconferences? You might like to prepare a short note for transmission on the spot. In such cases, you do not want to stop the communications program, write the note on your word processor, and then reconnect and transmit it. This application requires a communications package that enables you to create and edit files.

Unfortunately, at this time, most communications programs for the PC do not include editors. A few provide a command that allows you to load a separate word processing editor (such as WordStar, Volkswriter, EasyWriter) temporarily to create the file for transmission. Better yet, other communications programs feature integral full-screen text editors that enable

you to key the note to be sent directly into the communications buffer, using the editor to revise it if necessary. Once you're satisfied with the copy, you give the command to transmit it. You may even be able to edit one message while another is being transmitted.

Block-checked File Transfers

To this point, we have said nothing of transmission errors, such as those resulting from noise on the phone line. If both your PC and the other computer were set up for parity checking, the error might have been caught and the bad character displayed as, perhaps, an asterisk. Even with parity checking, the program does not necessarily detect errors and, detected or not, transmission may continue as if nothing out of the ordinary had occurred.

In spite of frequent complaints, the phone system is remarkably reliable, so such errors are infrequent. Besides, in many cases they are not important; receiving a memo that begins "Dear UsEr" should cause no problem. When critical

data is being transmitted, such as payroll information or an entire program, stringent error checking and automatic retransmission of bad data are needed.

Many communications programs include a mode that enables the PC to transmit whole blocks of data. Instead of sending a single character at a time, the program puts together longer packets or blocks of information. The length of the packet may be fixed by the program or you may be able to specify the length yourself. In either case, some extra error checking information is transmitted along with each packet.

While many communications packages handle block-checked transfers between PCs, they are not all equivalent. You should ask the following questions. Can binary files be transferred as well as ASCII? Are error statistics kept and logged? Can you take control after a specified number of errors to force the system to go on to the next block? Is there some indication on the screen to let you know how the transmission is proceeding? Can you

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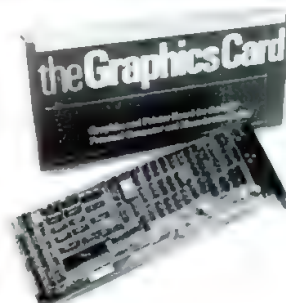
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display the characters as they are sent? Can you turn off the character display? Can you send comments to the remote computer ("Please insert the payroll data disk")? Is there a provision for data compression? Can you transmit groups of files with a single command, like "TRANSMIT communications.PRL"?

Unattended Operation

What if, in addition to being able to dial up and use remote services, you want your PC to serve as a remote resource for other users? Many businesses and hobbyists establish bulletin boards, which other users contact to leave messages for individuals, for a group of users interested in a particular subject, or for all the users of the system. You also may provide a service whereby remote users can dial in and transfer files to or from your computer. Companies with remote branch offices find this operation useful for calling in orders or sales reports. Hobbyists distribute public domain software in this manner.

If you are looking for a package that can handle unattended operation, you should consider several factors. The program must be able to control an auto-answer modem. It has to be capable of executing a series of commands, including conditional statements. If the connection is broken, the program should stop so that the phone may be hung up.

Security is also important. You will need safeguards such as passwords to frustrate mischievous or poorly trained users. The program should be able to disconnect someone who dials in, but does not communicate anything. Many programs have a mode in which the remote user can issue operating system commands on the central system, so you must be able to guard against someone erasing files, copying private files, or running programs on your computer.

An obvious advantage of unattended operation is that it can take advantage of reduced phone rates late at night. Your PC might wake up in the middle of the night and call your branch offices to obtain payroll data or the day's orders without an operator at either end. Some communications programs can dial a number, test for a connection (redialing periodically if none is established), send commands to the remote system, pause while files are being opened, transfer data in both directions, and then hang up.

Operating System Commands

When you are transferring files to and from disk, you may want to issue commands such as DIR, ERASE, CHKDSK, RENAME, COPY, and TYPE without leaving the communications program. These commands help if you forget what is

MENU-BASED systems are easier to use than command-driven systems when you are performing straightforward tasks.

in a file, run out of disk space and need to delete something, or want to see how much room remains on a disk.

Documentation and On-line Help

The generalization that menu-based systems are easier for novices to use than command-driven systems holds true when you are performing straightforward tasks. With a good menu-based program, users with some experience can get up character format variables, connect with a remote system, and operate it without referring to a manual. A command-driven system can be used as easily if it has good on-line explanations of the available commands. Still, you should read the manual first.

On the other hand, if you plan to use more complex capabilities, such as those requiring compatibility with several different systems, or unattended operation, a command-driven system will probably be more to your liking. If it is possible to put groups of commands together so that they may be executed with a single keystroke, a command-driven program will probably go faster and be less confusing for switching configurations and dialing and logging on to different remote systems. Of course, this means that someone with technical expertise needs to write the command routines.

In general, you should pay more attention to the tutorial value of the manual as an introduction to the capabilities of the program, than to its value as a reference document. /PC

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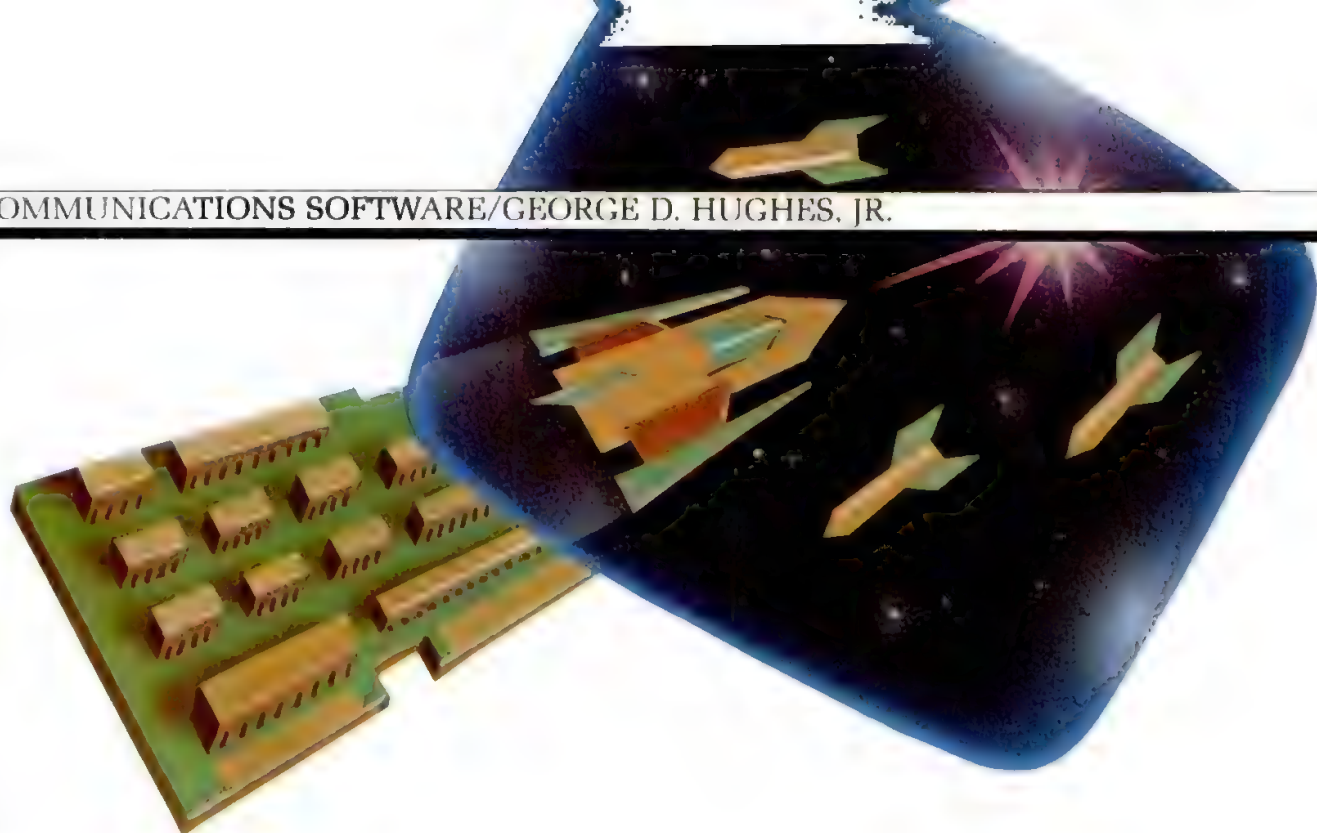
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List price: \$40

Most PC users eventually conclude that they want their computers to communicate with other computers. They may come to this conclusion simply because they want a copy of a program from a friend. But if the friend owns another type of computer and the disks are incompatible, the only way to share the program is

through telecommunications.

Other PC users are interested in information from services like CompuServe or The Source, including news, stocks and bonds, games, or personal notices listing equipment for sale. Still others may want to rent time on a nearby mainframe computer system.

Regardless of your purpose, you must run a communications program to telecommunicate. But first, unless you're a hardcore programmer who intends to write your own communications program, you need to buy the software.

IBM sells an unadorned asynchronous communications support (ACS) program called Version 1.0 that could be what

many PC owners are looking for. It handles many protocols required for communications, but does so without the bells and whistles of some more expensive alternatives. Though versatile in many respects, the program is difficult for the non-programmer to alter and it has several built-in limitations.

VERSION
1.00 of IBM's
**Asynchronous
Communications
Support program does
not let you create
phone number
directories.**

Requirements

To run ACS you need a board with an IBM compatible asynchronous port on it, 32K RAM, at least one disk drive, and a modem. You do not have to use IBM's communications adapter as long as the one you have is IBM-compatible.

Operation and Convenience

IBM usually excels at documentation, and the documentation for the ACS is no exception. The manual comes in the familiar notebook format with clear, easy-to-read instructions. The first part of the manual describes the basic operation of the program. The second part contains a semi-technical explanation of how the program works, how it selects and changes protocols, and how to change the program (written in MDOS BASIC) to modify existing tasks or add additional ones.

A protocol is a set of communications conventions that tell the computer when a line has ended, when to start or stop communications, the speed of data transfer, parity setting, the number of stop bits, and so on. The protocol acts like a traffic cop who directs and interprets the data being sent along a communications line. The best communications programs are extremely flexible in handling the many different protocols. An extensive appendix in the back of the manual shows the messages that could appear while running the ACS program and how to respond to them.

ACS provides menus to help you select protocol parameters. Once hooked up to the other computer, you can use the function keys to enter commands such as "break" or "force to sending."

To start the whole system, you insert the asynchronous communications disk into drive A and turn on the power. After the PC finishes its initial checkout, the AUTOEXEC.BAT command runs automatically; it asks you for the current date, then loads the ASC program into BASIC and starts it. The program first asks you to enter your screen width, 40 or 80 columns. The main Terminal Selection Menu then appears (see Figure 1).

Entering either of the first two menu selections instructs the PC to emulate a terminal that is compatible with two popular IBM mainframe operating systems. The second two selections allow you to talk to other companies' computers if you know their communications protocols. Option 5 lets two PCs talk to each other. Option 6 allows the PC to communicate with protocol parameters you have previously saved on disk.

Terminal Selection Menu, you will be presented with a second menu that displays various communications protocol parameters (see Figure 2). This menu provides the many common and not-so-common

Figure 1: Terminal selection menu

```
Choose Terminal Type
1  VM/370 Terminal
2  TSO Terminal
3  User Specified Half Duplex Term.
4  User Specified Full Duplex Term.
5  Personal Computer Communications
6  Terminal Description Stored on Disk
```

protocol options needed to communicate with various computer systems available today. With ACS you can choose line bit rates (baud rates) from 75 bits per second (bps) to 9600 bps. You can pick odd, even, mark, space, or no parity, and one or two stop bits. You can also determine the initial character you send to the other system, or vice versa, and choose up to three characters to be ignored when they are received by the PC. Further, the Protocol Parameter Menu also enables you to select the line end character that tells the PC, when the other computer has completed a line.

In the full duplex mode, you can choose to use the popular XON/XOFF support, which tells the PC when to send or receive information. You can also choose between local echoing and host echoing. Local echoing refers to the display of keyboard input on the terminal as it is typed. Host echoing occurs when the other system sends back the text for dis-

Figure 2: Protocol parameter menu

```
Choose a Terminal Feature
1  Line Bit Rate
2  Type of Parity Checking
3  Number of Stop Bits
4  Line Turnaround Char. Sent to Host
5  Line Turnaround Char. Sent by Host
6  First Character to be Deleted
7  Second Character to be Deleted
8  Third Character to be Deleted
9  Line End Character Sent by Host
10 Start up Selected Terminal
11 Return to Terminal Selection Menu
12 Save Current Terminal Specification
```



Setting Up Terminal Protocols

Unless you choose number six from the

play after it receives your input. Host echoing confirms that the other computer has received everything you sent, but it is slower than local echoing.

As you can see, ACS offers plenty of choices for setting up the PC to match the protocol required by other computer systems. This variety of choices can, however, be bewildering for those who are not familiar with the many protocols of all the various computer systems. You have to know what you are doing when setting up the protocol parameters with ACS, or you can waste a lot of time.

If you are not familiar with the protocol

of the other computer system, you should seek assistance. You may want to talk to the company that built the other computer or to someone who has more communications experience with that computer. Fortunately, for the first four options under the Terminal Selection Menu, the default protocol parameters apply to most other computers.

Talking to Other PCs

Talking to another PC is extremely easy with the ACS program. When I tried it, it worked perfectly the first time, and I've hardly ever gotten anything to work the

first time. I used a null modem, which is a plain 25-pin conductor RS-232 cable with the wires going from pins 2 and 3 reversed; that is, pin 2 on one end goes to pin 3 on the other end and vice versa. This switchover directs the transmit data signal output

H_{OST}
***echoing occurs when
the other system sends
back the text for
display after it
receives your input.***

(TXD) on one computer to the receive data signal input (RXD) on the other computer. A regular phone modem will do just as good a job if the PCs are too far away to use a cable. Talking back and forth and transferring files is a snap. The files to be transferred must be in textual form (like a BASIC file saved using the ASCII option) and each line can not be more than 254 characters in length. I found nothing to complain about with this part of the program.

Interfacing with Other Personal Computers

Trying to communicate with a personal computer other than a PC can be another story. Setting up the computers to type messages back and forth is not difficult as long as you know the protocol of the other computer. Transferring files between a PC and a different kind of microcomputer can cause problems. Unless you are lucky and the other computer's protocol matches the ASC defaults, you may face many hours of hard work before you can transfer files between computers. The ASC manual goes into detail on what the PC expects when receiving a file and what format the PC uses when sending a file. Unless you and the other computer's owner are BASIC programmers, you may not be able to get this option of ACS working.

Once the other computer is programmed to send and receive files, you follow the same procedures as when transferring to another PC. The PC thinks it is talking to a sibling. It requires only the correct line-end, begin transmission, end

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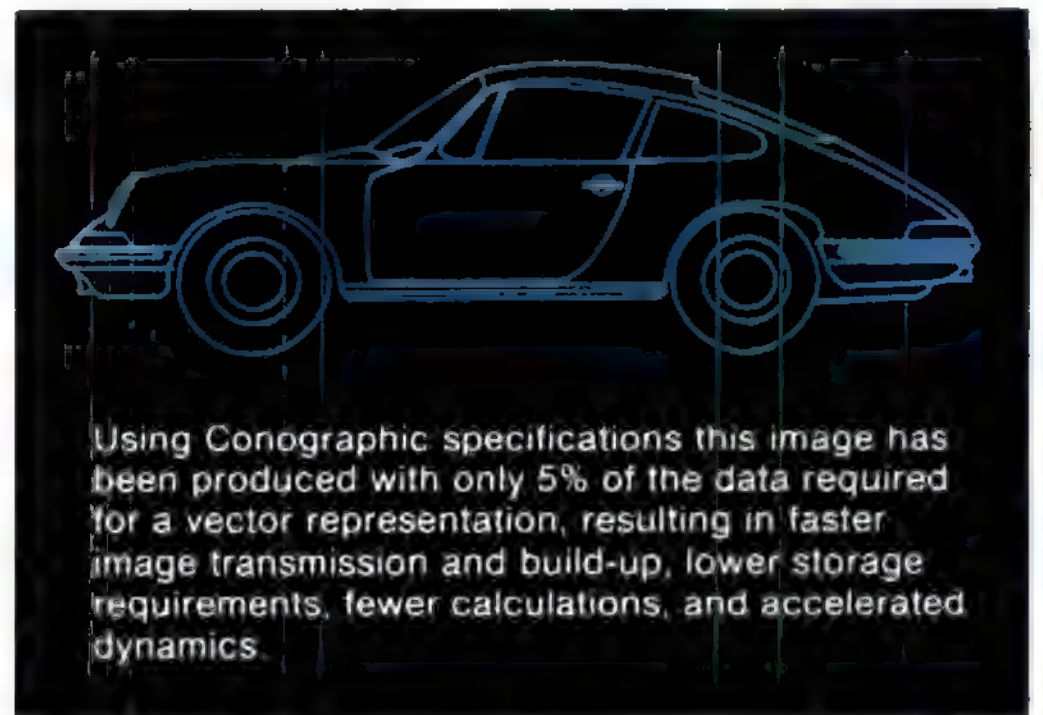
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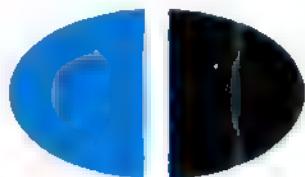
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IF YOU'RE CONFUSED PERSONAL COMPUTER,

At this moment, there are no less than 50 personal computers on the market. And more are being introduced every day.

On one hand, having all those options is a good thing. On the other, it can make picking the right one pretty difficult.



*Computers come in two parts.
You have to buy both.*

We'd like to help. So here are a few suggestions about how to buy the computer that's right for you.

Computers come in two parts.

One part is the "hardware," which is the machinery itself. The other is the "software," or a program, as it's sometimes called.

Software is the part that tells the computer what to do, the way a driver tells a car what to do.

Without software, a computer can't do anything.

And vice versa.

You have to buy both.

Buy the software first.

Since the reason you're buying a computer is to get the capability the software gives you (remember, it's the software that knows how to get things done), it makes good sense to pick the software first.

Start by making a list of the things you want to use the computer for. It can include almost anything—any kind of inventory, filing, accounting, graphics, reporting, record-keeping, analysis—you name it and there's probably a software program that does it.

Next, take the list into a computer store and ask the salesperson to give you a demonstration of the program, or programs, that will do the things you want.

Even though you'll need a computer for the software demonstra-

tion, keep in mind the computer is just a vehicle. The software is the driver. And once you've decided on the software, picking out the rest of the computer system will be much easier.

The simpler the better.

Look for software that's easy to learn, easy to use, and that does the job in the simplest way possible.

Good personal software should be, as the computer people say, "friendly." Meaning that it helps you do what you have to do without getting in the way.



Meaning there are no complicated routines to follow to perform a simple task. And no programming language to learn.

Some people, however, will tell you that software has to be complicated to be powerful.

Nothing could be farther from the truth.

Because in order for a program to appear simple to you on the outside, it has to be extremely complex on the inside.

ABOUT BUYING A HERE'S SOME HELP.

Good software keeps the complications in the computer, where they belong. And keeps the capability at your fingertips. It's that simple.

You simply have to see for yourself.

You can read any number of interesting books and magazines about personal computers. You can ask friends who have them. You can look at all the sales literature you can get your hands on. And you should do all those things before you decide to buy.

But as helpful as all that can be, there really is no substitute for a real, live demonstration.

When you do go out shopping, we recommend you take a look at the PFS® Family of Software.

The PFS family is designed the way we think all software should be: simple, straightforward and powerful.

Currently, three products make up the family. PFS:FILE, PFS:REPORT and PFS:GRAPH, with more programs on the way. Here's a little more about each of them.

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Basically, FILE works like a paper filing system, without the paper. So you can record, file, retrieve and review information in a fraction of the time it takes with a conventional filing system.

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transmission, and XON/XOFF characters to make things work smoothly.

IBM Host Computer Interfacing

The college near my hometown possesses a large computing system based on the IBM VM/370. I exercised the ACS program using a Hayes Smartmodem to tie into the IBM system. Getting started was not too difficult. The manual gives good directions on how to make the connection whether you use a direct-connect modem or an acoustic coupler. Status messages appear on the last line of the PC monitor. For example, "Line Connected" appears at the bottom of the PC monitor when communication through the modem is established with the computer system.

The manual also explains how to log on to the VM/370 system and how to modify some of the system parameters so that the PC's backspace and other characters and formats are interpreted correctly. You can include these changes in a file called PROFILE.EXEC, which runs automatically when you log on, similar to the way AUTOEXEC.BAT works on the PC.

The function keys F1 through F6 have responses when operating the PC as a terminal. These responses are similar whether the PC is communicating with the IBM VM/370 or another mainframe. Pressing

TALKING to another PC is extremely easy with this program.

F1 produces a BREAK signal that interrupts whatever processing is taking place. Since the ACS program displays only one error message at a time on the screen, other error messages are placed in a queue until you're ready to see them. Pressing F3 erases the error message on the monitor and prints the next error message in line. You can have the program ignore parity errors or other protocol errors by pressing F4. This comes in handy if you seem to be

communicating fine but keep getting error messages.

Striking F5 forces the terminal into a sending state, which means that the PC can send a message. This option is useful when you are first establishing a connection with the mainframe but do not yet know its turnaround character. The last function key, F6, provides a conventional display of all text sent from the VM/370 to the PC, and then displays the hexadecimal equivalent. While this is helpful during debugging of the communications link, it slows down transmission greatly.

Function key F2 gives you access to an action menu that offers several choices. You can change some of the protocol parameters if, for example, you notice strange characters appearing on your screen. You can press F2 and then select the Return to Terminal Selection option to change parity and then return to Terminal Operation without losing your communications link. Another option from F2 allows you to run BASIC to check and see what is on a disk using the FILES command or to use any other BASIC com-



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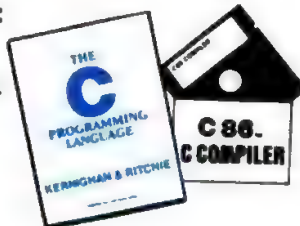
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mand. When you are finished, enter CONT and you are back in Terminal Operation mode.

The last three F2 choices are Upload, Download, and Compare. The latter enables you to compare files between your PC and the host system. If you select one of

A_{CS} IS
*a good base program
from which to build if
you are a BASIC
programmer.*

these options, you are prompted for the file names on each system and then ACS starts the selected action. The current line number of the file being sent or compared is displayed on the bottom status line to show you where it is in the file. The files being sent or compared must be ASCII text files; binary files are not allowed.

Blunderful or Wonderful?

Version 1.0 of IBM's Asynchronous Communications Support program is not the most versatile communications package. It does not, for instance, let you create phone number directories. Nor will it allow you to save or use automatic log-on sequences. You cannot transfer binary files, log conversations on the printer or into a file, or transmit multiple files. The list goes on. The manual does, however, include a detailed explanation of how the BASIC program works and how to modify or expand its options if you know how to program in BASIC. For example, I have already started to add a number of automatic log-on sequences to the program and plan to add the printer logging next. ACS is a good base program from which to build if you are a BASIC programmer.

You have to admit, though, a \$40 software package from IBM is not bad. The manual itself had to cost half of that. If you don't mind programming or can get around the limitations I have listed, this package is well worth the price.

But those of you who want more from a communications program should probably look elsewhere and pay extra to get what you want. /PC

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PC-DOS
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Systems Products Division
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List Price: \$40

Few people realize that the PC-DOS disk contains a BASIC program called COMM. It's a fairly well-kept secret because COMM is not one of the sample programs often used to demonstrate the IBM PC system. Some users may have seen a reference to COMM in IBM's *Guide to Operations*, which allots it a scant three pages in the short section on BASIC.

The Good News

COMM comes free with PC-DOS, which means users do not have to buy a separate software package to take advantage of the communications potential of the PC. A modem, a cable, and an RS-232C serial port are all that's needed to establish a communications link between two PCs, a PC and a different microcomputer, or between a PC and an IBM Series/1 computer that runs Real Time Programming System V5.1 or Event Driven Executive V3.0.

Users who subscribe to The Source or Dow Jones News/Retrieval can use the menu-driven features of COMM to configure their serial ports for these services automatically. To communicate with another service, menu option 6 can be used to specify baud rate, parity, data bits, number of stop bits, and whether to echo the characters to the screen (see figure 1 for the program's main menu).

The Bad News

COMM does little more than convert the PC into a dumb terminal. The keyboard provides the only means of sending information to the serial port, and the screen provides the only way to receive information. Obviously, the list of features not included with COMM is extensive. For starters, users cannot send data from a disk to the serial port, nor can information be stored on a disk as it comes in. Furthermore, no way is provided to echo incoming information to the printer for obtaining a

program and explain that it runs under either Disk BASIC or Advanced BASIC.

Users would probably learn more by loading the program and looking at the menu and the screens for the seven different options. The program is, in fact, self-explanatory. (See Figure 2 for the on-screen description of the program.)

One line in the *Guide to Operations* is well worth reading, however. It says, "You could also use this program as the model for writing your own telecommunications program." This statement seems to give users explicit permission to copy and modify the program to their hearts' content, even though COMM is copyrighted by IBM. (The copyright notice as well as the author's name, M.C. Rojas, are shown in the program's remark statements (REM), which do not print to the screen. The only way to see the copyright notice is to list the program.)

Modifying COMM is a great way for

Figure 1: COMM main menu.

```

COMMUNICATIONS MENU
Choose one of the following:

1 Description of program
2 Dow Jones News/Retrieval
3 IBM Personal Computer
4 Series/1
5 The Source
6 Other Service
7 End Program

choice ____

```

hard copy of what appears on the screen.

Users can still use the Print Screen function of the PC to obtain a copy of what is on the screen at any time. The process is slow, and it suspends transmission of data while printing from the screen, but it beats using a pencil and paper to record data.

Documentation

COMM comes with little in the way of instructions. The documentation is buried in IBM's *Guide to Operations* (Section 3: Operations, "Using BASIC," pages 3-13 to 3-16). The information does little more than offer a brief description of the pro-

Figure 2: On-screen description of COMM.

```

DESCRIPTION

An asynchronous communication link will be
established between the selected service
and the IBM PERSONAL COMPUTER as follows:

Baud rate      300
Parity         E
Data bits      7
Stop bits      1      Dow Jones. The
                        Source
                        2      Series/1

Options 3 and 6 allow for the above charac-
teristics to be supplied by the user to de-
fine a communication link to other services
or computers.

PRESS ANY KEY TO GO TO MENU

```


Let your **IBM** talk to the world!



Have you noticed that your IBM PC becomes slow and inefficient when talking with non-IBM systems? That's because the Asynchronous Communications Support package, produced by IBM, works best with another IBM PC, or with one of IBM's mainframe computers. If you attempt to talk to the rest of the world (after all, everyone doesn't use IBM), you'll find that the full-screen functions available to a "smart" terminal are not available to your PC.

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Exchange data with any computer. PC/InterComm lets you read data from your files and forward the information along to

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If you or your company is about to purchase (or already owns) an IBM Personal Computer, PC/InterComm will open it up to a whole new world of communications.

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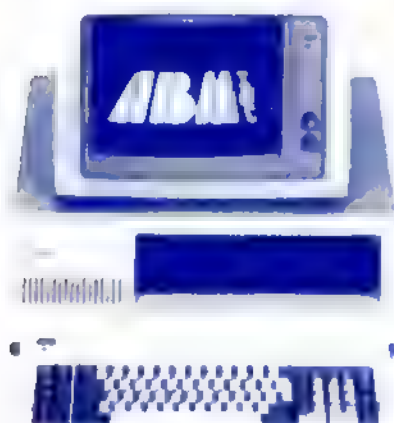
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users to learn to program in BASIC and to sharpen their skills. A practical first improvement is to establish a buffer for incoming data and then dump the buffer to the printer or to a disk file. This can be programmed as an automatic function or incorporated into the program's main menu. Users may also want additional menu options (and the associated RS-232C parameters) for services such as Compu-Serve and Dialog, which are not currently included on the menu. With imagination and skill, users can extend the range of COMM's applications.

The Hayes Smartmodem

As with other IBM communications software (see "Life Among the Bulls and the Bears," PC, November 1982), COMM makes no reference to the Hayes Smartmodem or any other auto-dial modem. After a user has made a selection from the

COMM

converts the PC into a dumb terminal.

menu and the program has opened a communications port with the specified characteristics, the COMM message reads, "Place your call and insert the phone receiver into the modem, or switch your data set from talk to data."

Users who do not have a Smartmodem are not out of luck. Once the above message flashes on the screen, the user can type

```
AUX [RETURN]
ATT [RETURN]
and for TouchTone service
ATD[phone number]
or for rotary dial service
ATDP[phone number]
```

The Smartmodem wants to see everything typed in uppercase; to avoid trouble, don't disappoint it.

COMM is obviously not in the same league as other commercially available communications programs, but it is cheap. Since it is written in BASIC, users can modify and upgrade it until they have put together their own custom-built system.

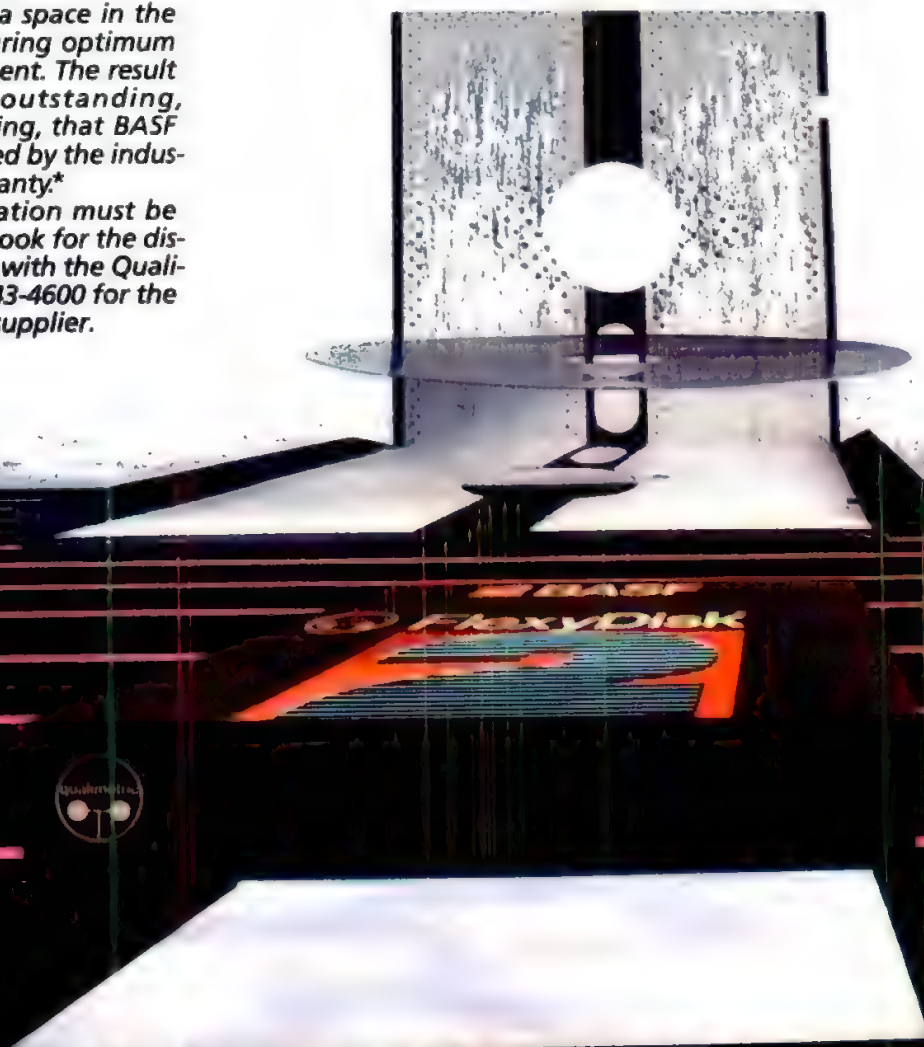
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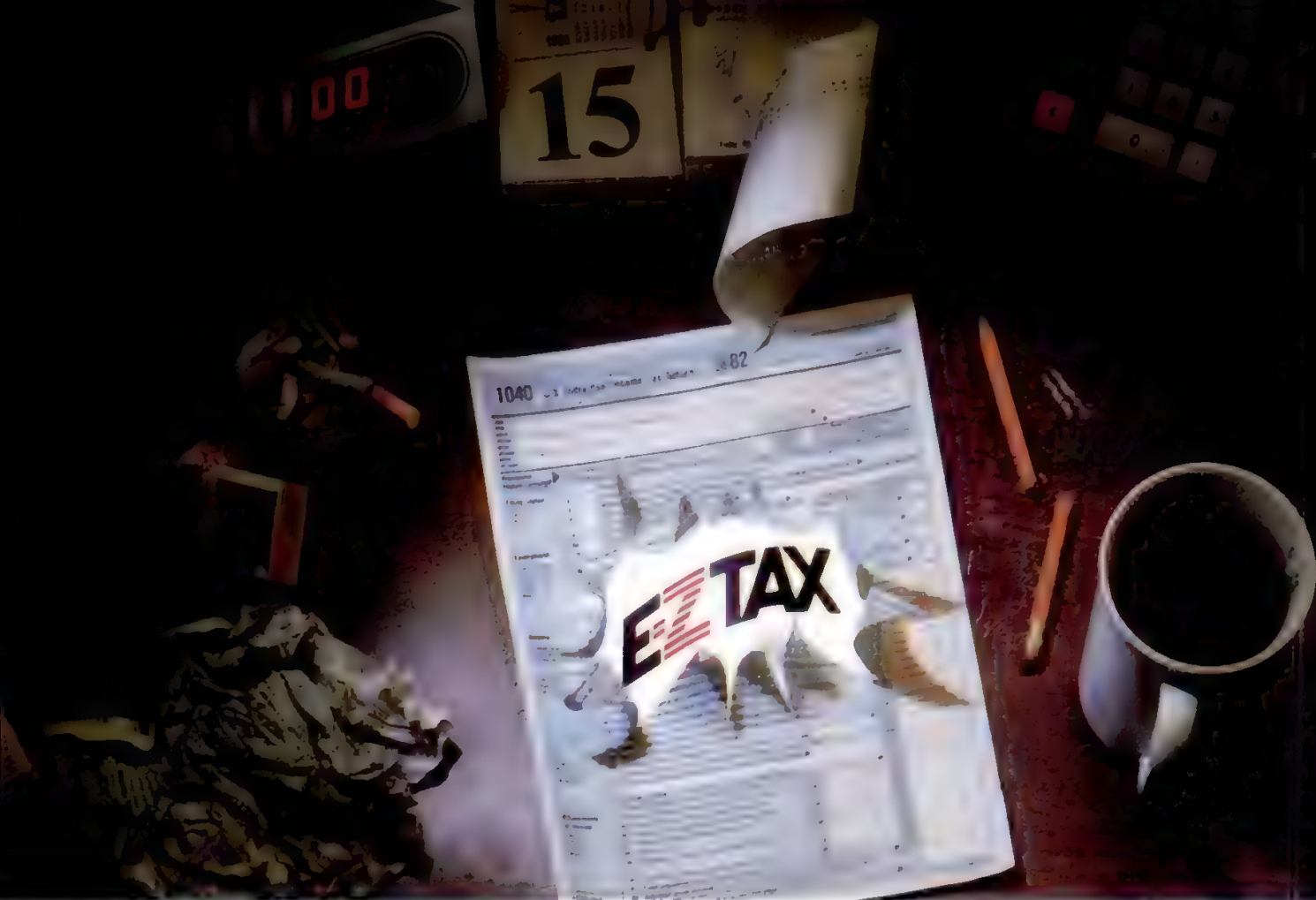
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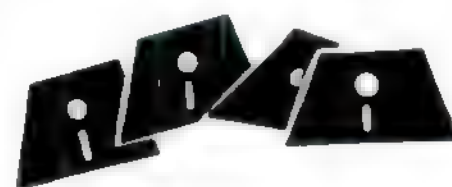
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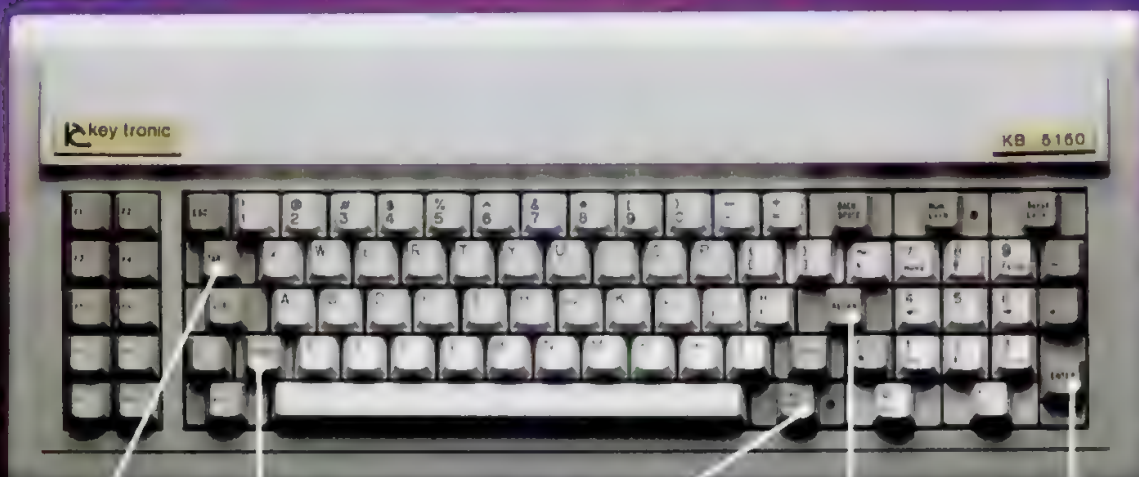
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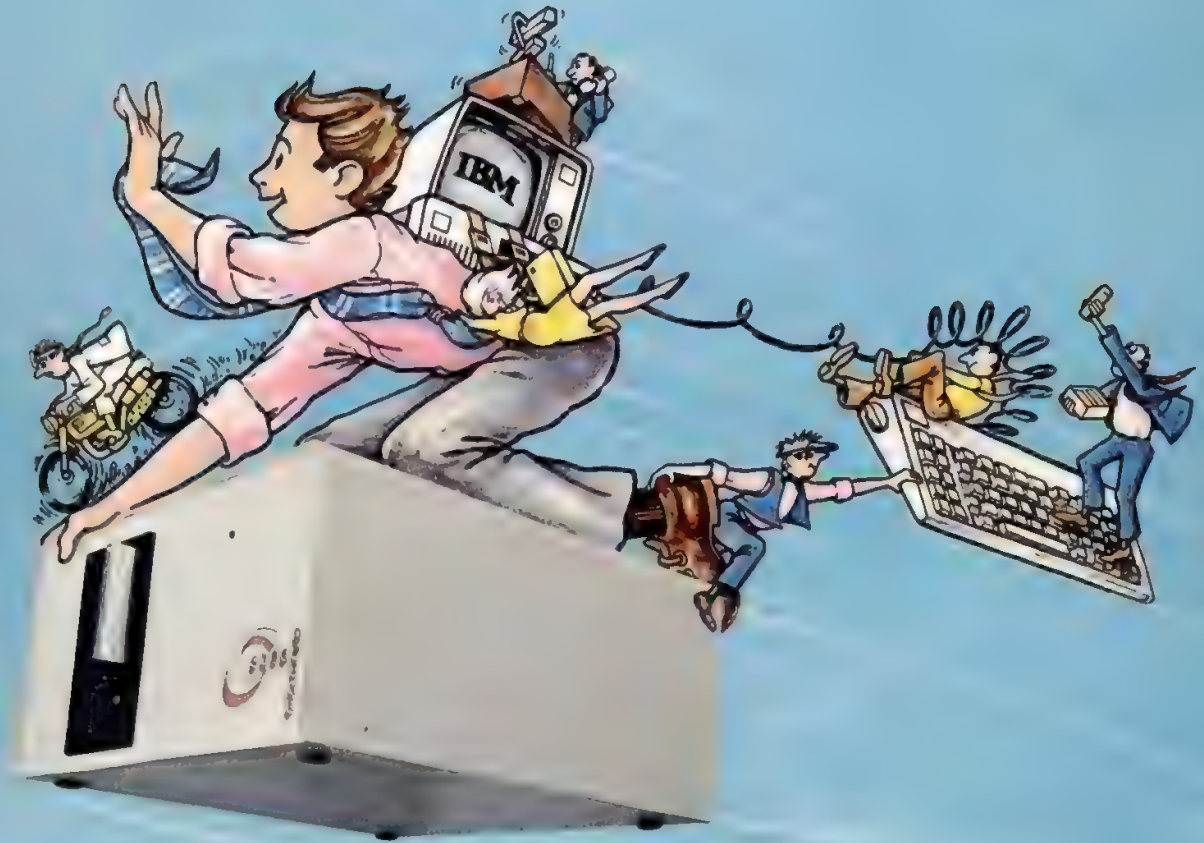
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Dynamic Microprocessor Associates (DMA) wrote its first version of ASCOM for CP/M-80-based computers several years ago. Building on feedback from users, DMA has revised this communications program several times, and a comprehensive, relatively bug-free program has evolved. ASCOM is not, however, a program written for the novice. Only someone with programming experience can understand ASCOM's manual or modify the program.

The IBM PC version of ASCOM comes ready to run on a PC equipped with a serial port, a Hayes Smartmodem, and at least 32K of memory. If you don't have the Hayes Smartmodem, you can still use the program, but without its auto-dial command. DMA produces versions for either PC-DOS or CP/M-86.

Compatibility with Remote Computers

DMA distributes ASCOM with certain default values for baud rate, character format, handshaking, echo, parity, protocol, and more than a dozen other conventions used in telecommunications. These are easily changed, and once the desired values are specified, a single command makes them the new defaults. So, if you always communicate with the same remote computer, you can make ASCOM's default values compatible with that computer.

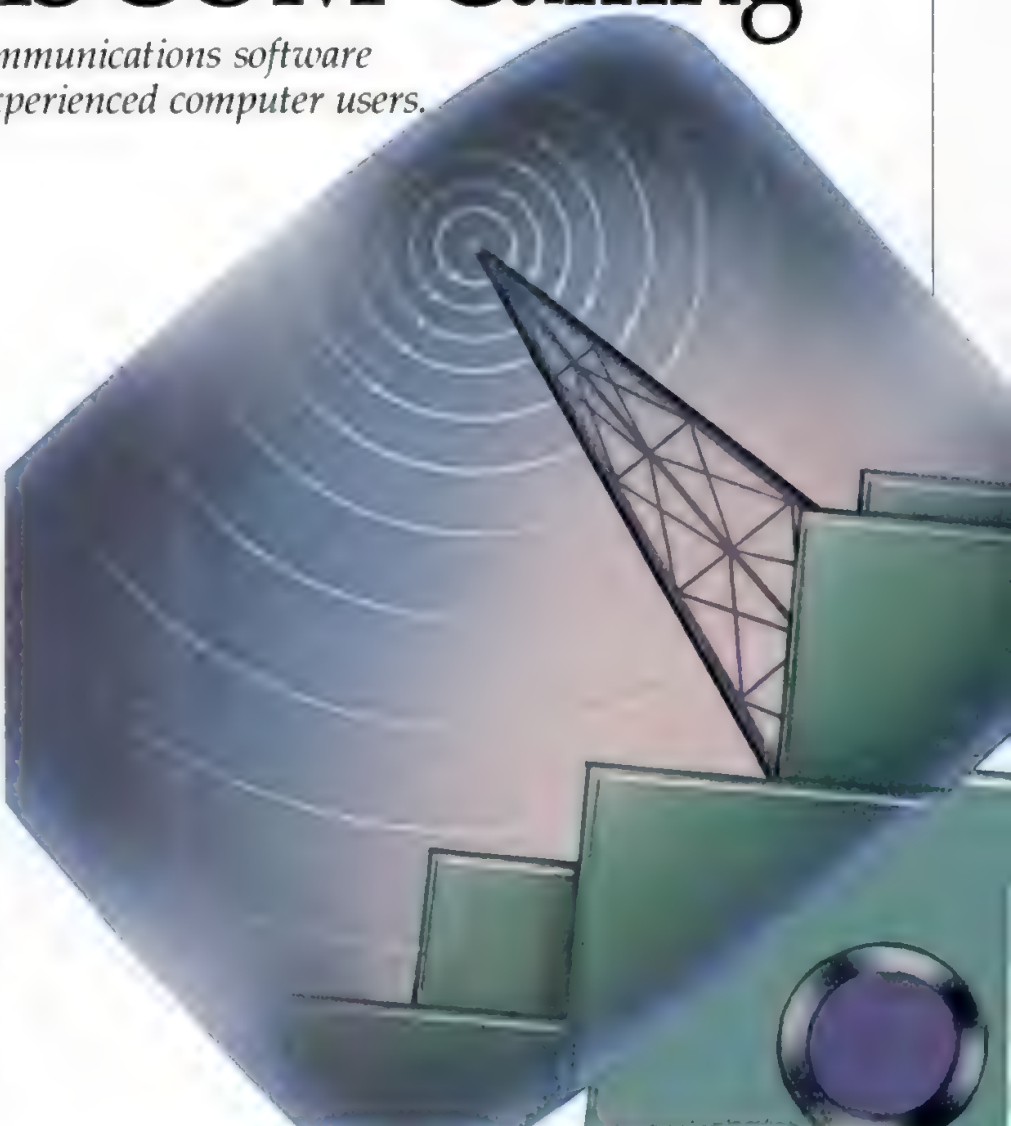
ASCOM is somewhat more difficult to

use, however, if you communicate with more than one remote computer system. Changing ASCOM's defaults every time you begin "talking" with another computer can be tedious. But ASCOM allows you to create batch commands using ED-LIN, COPY, or a word processor. You can save the batch commands as disk files (see Figure 1 for an example). A single batch command can reconfigure the program to operate with each remote computer. You could call up one batch command when telecommunicating with CompuServe, another when talking with a user group's bulletin board, and still another when using a university's research computer.

Finally, ASCOM allows you to change its default values while communicating with another computer. You can use ASCOM's STAT command at any time to determine the program's current configuration. This feature certainly beats the trial-and-error method of trying to discover the characteristics of the remote computer system. It can also save time and long-distance telephone bills.

Dialing a Remote Computer

With a Hayes auto-dial modem and ASCOM, you can call a remote computer with a single dial command. With a different type of modem, however, you have to



write your own auto-dial routine, which requires knowing how to program in assembly language.

One drawback is that, unlike some communications software programs, ASCOM does not allow you to create directories of telephone numbers or passwords needed to gain access to other computers. Batch commands, however, can be used to automate dialing. Since ASCOM's batch commands can contain simple conditional statements, you could create one that dials a number, and if the line is busy, tries again after a brief delay (see Figure 2). Few other communications programs offer this sort of flexibility in creating command files with conditional statements. If you have little or no programming experience, you will probably need help putting complicated batch commands together.

Logging On

One user's experimentation produced a batch command file that dialed The Source. Once the connection was established, the batch file automatically logged on and gave the commands to enter the telecommunications mail system. Doing this with one system, however, does not

mean that a similar batch command file could always be written for any remote computer. If the computer system called has strict requirements on the order in which it receives messages, the process will be particularly difficult.

Character Format Choice

ASCOM can transmit 7- or 8-bit characters. 7-bit characters may have even or odd parity, and the parity bit is typically always on or off. Exceptions do exist, however. A computer at Rutgers University, for example, uses the parity bit arbitrarily, so ASCOM doesn't work with this system. ASCOM's authors could have solved the problem by providing an additional option: ignoring the parity bit.

If you send machine language programs and other 8-bit data to a system that supports only 7-bit (ASCII) files, a utility program to break each byte into two 4-bit nibbles would be useful. Unfortunately, ASCOM does not include such a program, nor is there a provision for compressing data.

Special and Control Characters

When control characters are received

by ASCOM, they are stored in the communications buffer but are not displayed on the screen. If the contents of the buffer are saved in a disk file, the control characters

B***O*****T*****H***
parties spent
considerable time
trying to understand
what the other
was doing.

will also be there. At times, having the characters displayed temporarily on the screen is helpful. For instance, when I transmitted this story by phone to one of PC's editors, we had difficulty getting our computers to talk to each other. Since I was using ASCOM, I could not see on the screen which control characters the editor had typed. Both parties spent considerable time trying to understand what the other was doing.

ASCOM can transmit most control characters, but two important ones, Ctrl C and Ctrl P, are intercepted by the operating system and are not sent. Many remote computer systems use Ctrl C as a command for stopping execution of a program, while others use Ctrl P.

Fortunately, ASCOM provides a solution for working around this restriction. It offers two translation tables: one for transmitted characters and the other for received characters. By changing entries in each table, you can translate the character that is sent or received. You can change the transmit table, for example, so that whenever a Ctrl V is typed, a Ctrl C is actually sent. This transliteration capability enables you to communicate with a remote computer that has a non-ASCII character coding scheme, such as IBM's EBCDIC code.

At times you may want to ignore certain incoming codes and keep them out of the received disk file. For instance, many systems transmit several NULL characters (0) at the end of each line. By using ASCOM's translation table, you can filter these out as they are received.

ASCOM gets high marks for flexibility

Figure 1: ASCOM batch file

COMMENT	configure for communications with a particular
COMMENT	system
COMMENT	-----
BAUD 1200	set transmission speed
PROTOCOL OFF	select X-ON/X-OFF handshaking
PARITY EVEN	seven bit data with even parity
INIT	put the above configuration into effect
COMMENT	
COMMENT	open disk file and begin data capture
COMMENT	-----
OPEN B:DISKFILE	data will be captured in the file named
CAPTURE ALL	incoming and outgoing data will be logged
CAPTURE ON	begin logging from this point on

This is an example of an ASCOM batch file. It would be created in advance and saved on disk, and it would be executed with a single command. The first four commands override the default communications configuration, and the last three set up a disk file for capturing the ensuing conversation. Notice that comments are allowed in these miniature programs.

Figure 2: DIALCOM command file

DIAL T 392-1234	dial system. "T" signifies tone dialing
IFERR WAIT 300	if no connection, pause for 300 seconds then
IFERR BATCH DIALCOM	retry this command file.

This command file, called "DIALCOM," illustrates conditional branching. If no connection were made (due to, say, a busy signal), the system would pause for 300 seconds and then reexecute the same command file. This would go on indefinitely until a connection were established.

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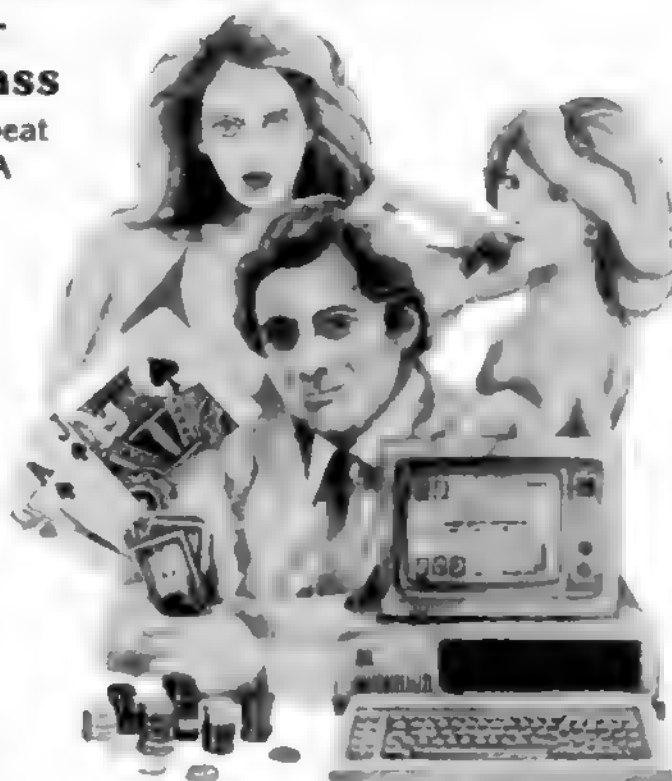
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in handling control characters, but setting up the transliteration tables and giving commands to ignore various characters is time-consuming and requires an understanding of communications. Fortunately, once you have figured out the commands

ASCOM GETS high marks for flexibility in handling control characters.

and have defined the tables, you can save them as part of the default configuration.

Saving a Transcript

While you are conversing with a remote computer, the printer may be turned on and off at will with ASCOM. When paper runs out or the printer malfunctions, ASCOM does not send an X-OFF to stop the remote computer temporarily. Incoming data will be lost unless the information is saved on disk file.

Saving Data on Disk

ASCOM offers several options for saving data on a disk file. You can capture everything that comes in or out, incoming characters only, or transmitted characters only. ASCOM can filter out specified incoming codes. If you see an uninteresting portion of a transmission, a single command suspends the capturing of information.

The conversation is stored in an internal memory buffer of 44K (for PCs with at least 64K of memory). When the buffer becomes full, the information is automatically written to the disk to make room for more data. While data is still in the buffer, you can suspend interaction with the remote computer and examine the contents of the buffer, clear the buffer, or save it in a disk file. While ASCOM does not let you edit the material in the buffer, it is somewhat more flexible than many programs since you can control scrolling.

Handshaking Conventions

If the buffer fills up while capturing data in memory, ASCOM automatically



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sends an X-OFF character to suspend transmission from the remote system, writes the buffer to disk, and then sends an X-ON to resume transmission. It also includes a mode for sending files to sys-

ASCOM's remote mode could connect your PC with an unattended computer.

tems a line at a time, using carriage return and line-feed characters to control the transmission.

X-ON/X-OFF is the most common handshaking convention, but if you need another (for communicating with a UNIVAC computer, for instance), you must write a subroutine. ASCOM offers no provision for a double-buffering scheme for communicating without handshaking.

Manipulating the Disk Buffer

ASCOM has several commands for manipulating the disk buffer. You can display the entire buffer or look at parts of it by scrolling in either direction. The contents of the buffer may be written to the disk manually or automatically and cleared as desired.

Editing Functions

While examining the contents of the communications buffer is possible, ASCOM has no integral editor. Information cannot be added to or deleted from the buffer. Any editing must be done outside of ASCOM with a word processor.

Using a word processor with ASCOM is easy because you can call up your word processing program (or any other program for that matter) without leaving ASCOM. If you plan to send electronic mail to participate in teleconferences, this capability is useful, even though it is not as convenient or as quick as an integral editor.

Transferring Files

ASCOM transmits files to either computers that use the X-ON/X-OFF protocol or those that accept a single line at a time.

Rapid, block-oriented file transfers are possible as long as both the sending and receiving computers are running (or simulating) ASCOM. Error checking and automatic retransmission are done for every block, while error statistics are kept and reported to the user. The continuously displayed status of the file transfer lets you know whenever a block is received at the same time that an error occurs or prolonged inactivity exists. Binary data may be transferred, comments may be sent to the operator of the remote system, and groups of files may be transferred with a single command. ASCOM even has a protocol for retrieving public domain software from the CP/M Users Group bulletin board systems.

Unattended Operation


With ASCOM's remote mode, the computer system you are communicating with can issue commands to your PC. This mode facilitates the transfer of files to and from unattended computers. Such file transfers necessitate using relatively complex batch commands. In writing these commands, you can add subroutines for such conditions as a busy phone line.

ASCOM's remote mode could, for instance, connect your PC with an unattended computer (that is also running ASCOM), transfer files in both directions, and then hang up and repeat the process

SETTING UP computer systems for unattended operation requires some programming knowledge.

with another remote computer. Such capability may be particularly useful for a company that has computers in its branch offices. Administrative memos and the day's orders could be exchanged with ASCOM's remote mode. Unattended file transfers could even be made late at night to save telephone expenses.

Setting up computer systems for unat-



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How to get your file

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We've all been through that same excruciating moment when we realized that we were going to have to learn a lot more than we wanted to know about programming, in self-defense.

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Many of us with a little bit of help called dBASE II, the relational database management system (DBMS) for micros.

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tended operation requires some programming knowledge. But once command files are created, the operator does not have to understand them. Although ASCOM handles unattended file transfers well, it is not designed to act as a stand-alone bulletin board or electronic mail system.

Operating System Commands

ASCOM allows the user to type, erase, or rename files, and display the disk directory. It also allows the execution of another program from within ASCOM. For example, you could run the DSKCHK utility supplied by IBM to see how much room was left on a disk without leaving ASCOM.

Documentation and On-Line Prompts

The ASCOM manual is poorly organized and has no index. Commands are listed alphabetically; if you don't know the name of a command, you won't be able to find it. The manual seems to be written for programmers. To make matters worse, the

manual is outdated; it is two versions behind the program. DMA promises that a new manual will be out soon. At this point, anything would be an improvement.

ASCOM IS NOT designed to act as a stand-alone bulletin board or electronic mail system.

The program can be run in either menu or command mode. In command mode, on-line help screens are offered for each command. They are more useful and current than the explanations in the manual.

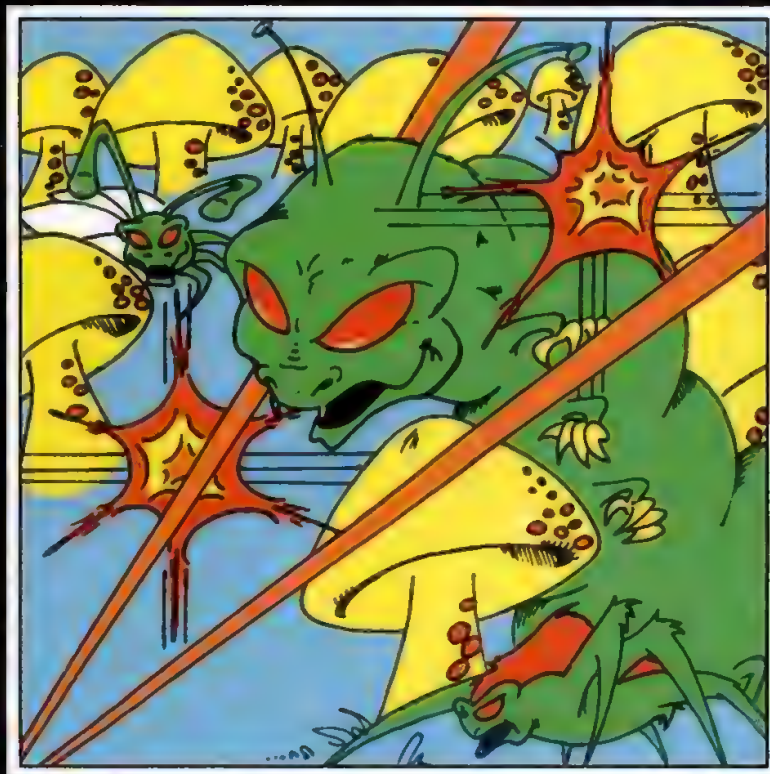
Menu mode provides access to many, but not all of the commands. If you are a newcomer to computers you could start the program in menu mode, set the trans-

mission rate and character format, and dial a remote computer without trouble—at least once you have figured out that all menu selections must be written in capital letters.

However, to capture a conversation on disk or send or receive a file, familiarity with a number of the ASCOM commands is necessary. Unfortunately, to use the command mode, you must read through the manual from cover to cover. Even after doing so, most beginners make mistakes, such as failing to realize that opening a disk file does not mean that they automatically capture the information on the disk since separate commands are needed.

In general, ASCOM is powerful and flexible but difficult to use. The program was designed with programmers in mind, not first-time users. ASCOM can be a great help, but if you are not used to working with computers, you should count on having someone who is technically oriented (such as your dealer) configure the system defaults and set up various batch command files for future use. /PC

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ARE YOU READY TO RECEIVE THE NEW PROGRAM UPDATE?
OK, JUST TYPE ALT-R AND [ENTER]
FILE NAME RATES EXE

TRANSMITTING RATES EXE

YES PAT - AND WE CAN BOTH TYPE AT THE SAME TIME
YES - IT DOESN'T ALLOW A WORD TO BE SPLIT AT THE END OF A LINE
GO AHEAD - SEND IT TO ME - AND THEN I'LL SEND THE NEW DATA

YES PAT - AND WE CAN BOTH TYPE AT THE SAME TIME
YES - IT DOESN'T ALLOW A WORD TO BE SPLIT AT THE END OF A LINE
GO AHEAD - SEND IT TO ME - AND THEN I'LL SEND THE NEW DATA
RECEIVING FILE NAME (OR [ENTER] FOR RATES EXE)

RECEIVING RATES EXE

HI PHIL - CAN YOU READ THIS?
ISN'T INTELLITERM EASY? DID YOU NOTICE HOW THE WORDS WRAP?
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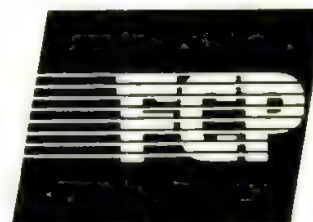
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A moderately priced communications package with many easy-to-use features, PCMODEM Version 1.4C contains several improvements over the version reviewed last year ("Three Communications Go-Togethers," PC, June/July 1982). But it still faces stiff competition from PC-TALK and other assembly language communications programs. Written in BASIC, the software is now available in interpreter and

compiled versions designated 1.4 and 1.4C, respectively. Only the compiled version was tested in this evaluation.

Features

PCMODEM uses the IBM PC function keys and cursor keys to perform several communications tasks, such as transferring disk files, toggling the printer, and switching the baud rate between 300 and 1200. Other function keys allow the user to

change duplex mode, the number of data bits, and the type of parity error-checking used during a communications session.

PCMODEM's most notable feature is its telephone dialing directory. The PCMODEM disk contains a utility program called PDMSETUP that can either be run from within PCMODEM or as an independent program to add, delete, or change any name, telephone number, and communications parameter associated with a particular remote computer system.



Four times faster than any 300 bps modem, to be precise. With Hayes Smartmodem 1200, any computer with an RS-232C connection — such as the IBM Personal Computer, TRS-80® or Apple® III — can communicate over telephone lines with other computer terminals or printers. Smartmodem 1200 connects directly to any standard telephone jack in the USA. Dialing can be Touch-Tone® pulse or both. It can even operate over multiline phone systems (PBX) to dial numbers, receive and transmit data, and disconnect — automatically. An internal speaker lets you hear the call being made and monitor its progress. That way you'll know immediately if the line's busy or you reach a

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Smartmodem 1200 is two modems in one. Like the original Hayes Smartmodem, it can communicate with other Bell 103 type modems at up to 300 bps. Plus it's a 1200 bps modem for communicating with the faster Bell 212A type modems. Unlike many 1200 bps modems, Smartmodem 1200 lets you select full or half duplex, for compatibility with time-sharing services or any other system you choose. Smartmodem 1200 allows you to access The Source,™ communicate with

your branch offices, or exchange programs with other computer users. In fact, it performs just about any communication function you can imagine, and can be program controlled using any language.

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INTERACTIVE ELECTRONIC
WORKSHEET

YES

ON-LINE REFERENCE GUIDE

NO

"NAMING" OF CELLS
OR AREAS

NO

PLAIN ENGLISH PROMPTS

NO

INDIVIDUAL COLUMN
WIDTHS

NO

EXTENSIVE FORMATTING
CAPABILITIES

NO

PROTECTED CELLS

NO

MULTIPLE LINKED
WORKSHEETS

NO

SORTING CAPABILITY

NO

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Compare ease of use. All Multiplan prompts are full length words or phrases. And Multiplan provides "naming," the ability to assign a plain English name to any

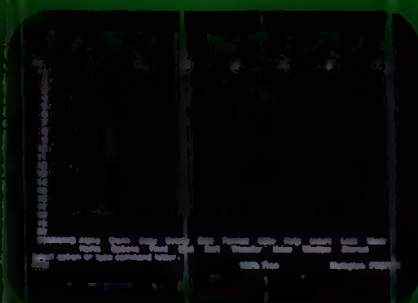
cell or area. "Gross Profit = Sales—Cost" rather than "AA44=AZ23—BK154." Which means you can work more intuitively. And faster.

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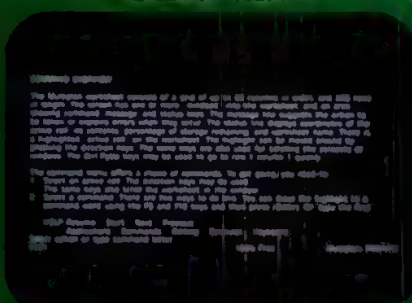
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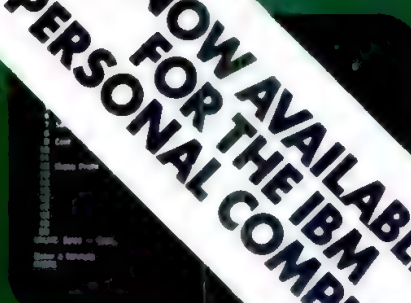
INTERACTIVE ELECTRONIC
WORKSHEET

YES

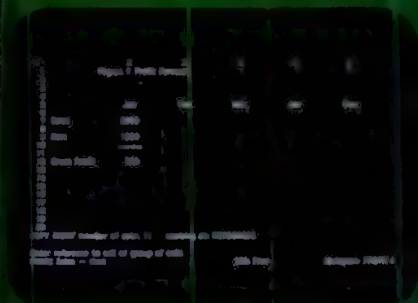


ON-LINE REFERENCE GUIDE

YES

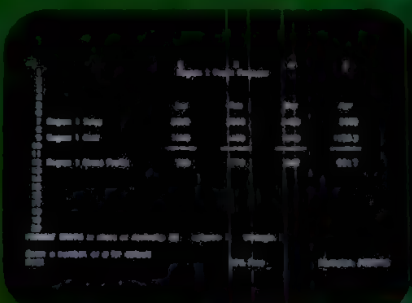


"NAMING" OF CELLS
OR AREAS



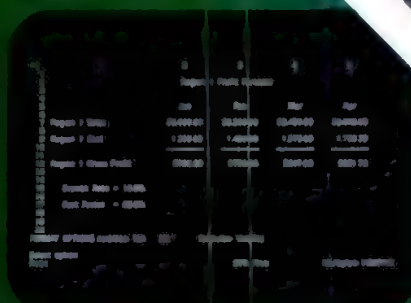
PLAIN ENGLISH PROMPTS

YES



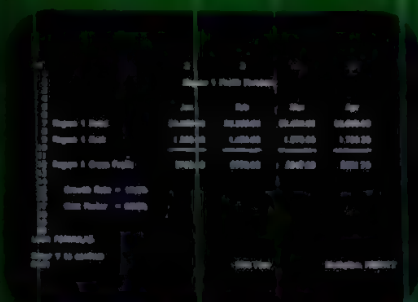
INDIVIDUAL COLUMN
WIDTHS

YES



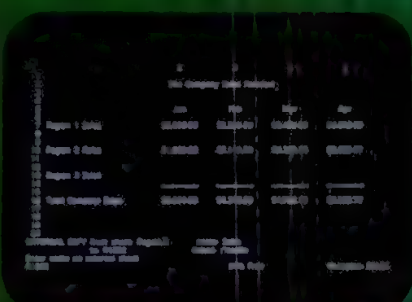
EXTENSIVE FORMATTING
CAPABILITIES

YES



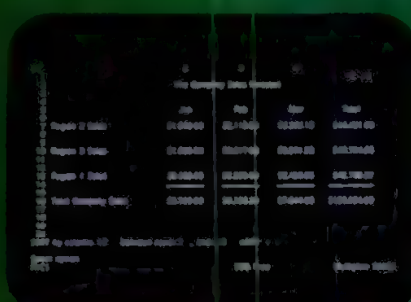
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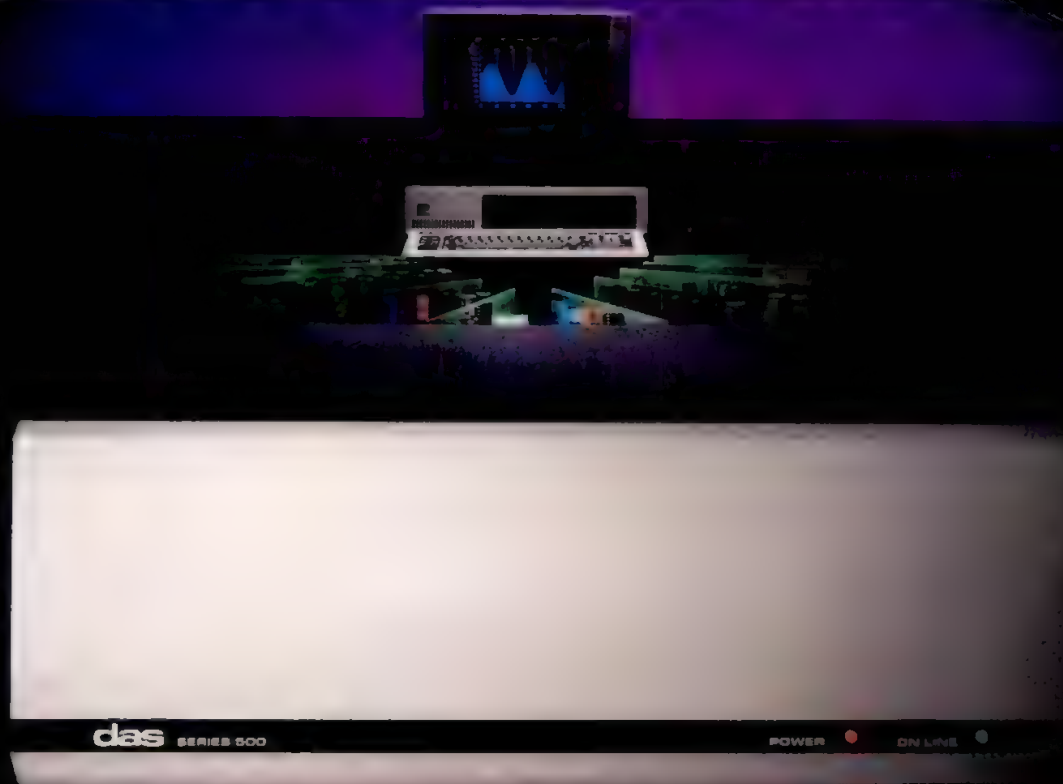
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CIRCLE 323 ON READER SERVICE CARD



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CIRCLE 210 ON READER SERVICE CARD

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For instance, I regularly use my PC to communicate with six different computers: the CompuServe information service, the bulletin board of the local PC user group, PCs owned by three different individuals, and the mainframe computer where I work. Each has its own phone number and its own log-on dialog. Further, the mainframe accepts only 7-bit, no parity data, while the other five take 7-bit, even parity. Using **PCMSETUP**, I can configure the disk for each computer. When I'm ready to communicate with one of those systems, I simply select that computer as an option on **PCMODEM**'s main menu, eliminating the need to set up the communications protocol, look up and dial telephone numbers, remember passwords, or go through the log-on procedure.

PCMSETUP provides an easy-to-follow main menu and a summary of function key operations at the bottom of the screen. Telephone numbers entered during setup may contain MCI and Sprint local access numbers and authorization codes, as well as the time delays required

communications parameters are automatically put into effect before the number is dialed.

Compatibility with Hayes

PCMODEM takes advantage of several Hayes Stack Smartmodem features directly from the program's main menu. You can dial a telephone number automatically by either selecting a stored dialing directory number or by entering a full telephone number after pressing function key 4. The modem dialing mode can also be toggled between touch-tone and pulse-type dialing by pressing the down cursor. If the number you dial is busy, **PCMO-**



Hayes Stack
Smartmodem 1200

DEM allows you to redial the number automatically until a connection is made; the redial occurs every two minutes and is accompanied by a chime to remind you that redialing is still in progress. When an

PCMODEM takes advantage of several Hayes Stack Smartmodem features.

between the transmission of the numbers and the codes. Users can include a log-on message of 30 characters or less, as well as special code characters to produce carriage returns. **PCMSETUP** also enables users to alter the global default communications parameters, those **PCMODEM** uses when no specific remote computer is selected from the program's main menu.

When all the dialing directory information needed to communicate with a specific remote computer system has been entered, it may be saved to disk for access later from **PCMODEM**, the main program for dialing and logging on with that computer system. Information saved in this manner is later recalled in summary form when the **PCMODEM** main menu dialing command is initiated. If a number is dialed using this directory, all stored com-

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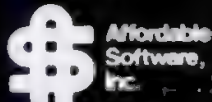
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auto-redial connection is completed, PCMODEM sounds PC's bell to get your attention. When you complete a session on a remote computer or bulletin board, PCMODEM also gives you the option of hanging up. Pressing function key 9 causes the Smartmodem to drop the telephone connection. The software also allows you to switch the modem from originate to answer mode with the left cursor key.

PCMODEM offers two other important features: X-ON/X-OFF control and break signal transmission. While receiving a file or conversing with another com-

puter, function key 1 switches PCMODEM from the conversation mode to the command mode, simultaneously sending an X-OFF character to the other computer to halt data transmission temporarily. Hitting function key 1 again sends an X-ON character to tell the other machine to resume data transmission. A true break signal—the equivalent of several null characters without start, parity, and stop bits—can also be sent to a computer to interrupt an operation in progress by pressing the Alt and B keys simultaneously.

Unlike some communications pack-

ages, PCMODEM offers a file transmission throttle option. This feature helps when sending messages to computers that have prompted transmissions. After selecting a file for transfer from disk to the communications port, you can select a time delay. This delay occurs between the transmission (upload) of each line contained in the file and can be set between 0 and 9 seconds.

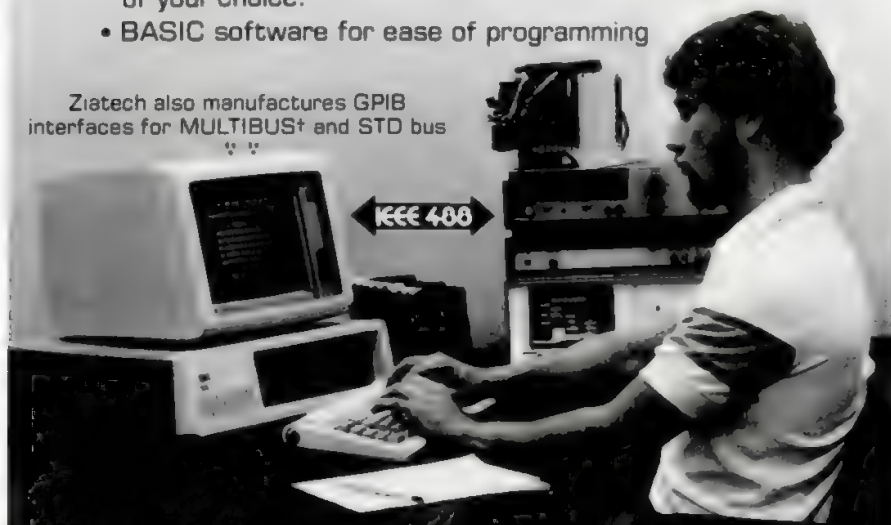
A form of protocol file transfer is also possible with PCMODEM. When you press function key 7 to receive a file, two choices are offered. One is to save all ASCII data coming from the modem to a disk file, and the other is to receive a file using the Ward Christensen/MODEM communications technique. The first option is for most microcomputer file transfers, while the second is used with CP/M systems. The Christensen/MODEM protocol performs automatic file transfer and error checking (checksum rather than parity)

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CIRCLE 455 ON READER SERVICE CARD

WHEN AN auto-redial connection is completed, PCMODEM sounds PC's bell to get your attention.



causing the CP/M system to retransmit blocks containing errors automatically.

PCMODEM also provides an excellent Exit menu. When function key 10 is pressed, it offers the options of exiting to DOS, listing an ASCII disk file, printing an ASCII disk file, or returning to PCMODEM operation. This feature allows you to view a file captured directly to disk and



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CIRCLE 416 ON READER SERVICE CARD

check for transmission errors before logging off a remote computer system. If you are using one of the print spoolers available for the PC, this feature also permits simultaneous printing of a downloaded file while downloading additional files.

Performance

PCMODEM operates crisply and smoothly, and it displays all messages in comprehensible English. Updating the dialing directory is easy, and the software presents its prompts logically after each

UPDATING the dialing directory is easy.

major command is initiated. Many brief menus are provided on the bottom line of the screen during different modes of operation, making PCMODEM simple for the communications novice to operate.

The program is specifically designed to work with either a Hayes Stack Smartmodem 300 or 1200. I performed file transfers with both of these modems without problems at 300 baud, but file transfers at 1200 baud using the 1200 modem were not as satisfactory. Downloading of large files at 1200 baud produced some data loss when I tried to capture directly to floppy disk. I got better results using the JEL and JFORMAT electronic disk software at 1200. Files received in that manner could be handled in much the same way as memory-captured files using an assembly language communications package such as CROSSTALK.

All of PCMODEM's function and control keys produced expected results, except for the switch that turns a Smartmodem auto-answer on and off. Pressing the left cursor turns the modem's speaker on and opens the telephone line but does not toggle the auto-answer on or off until a key is pressed to turn off the high-pitched carrier detect signal. This is a minor nuisance, one which the software author could have easily eliminated.

From One Program To Another

Unlike its predecessor, PC-TALK.III isn't free—but it is revised, improved, and expanded.

PC-TALK.III

Freeware, Headlands Press
P.O. Box 862
Tiburon, CA 94920
List Price: \$35

A new version of the asynchronous communications program PC-TALK is now available from Freeware. PC-TALK.III offers some new features and expands several functions of the earlier program (see "PC-TALK," PC, August 1982).

The updated program features an automatic error checking option in the transmit mode that is compatible with standard checksum routines. PC-TALK.III also allows users to send binary files.

Other improved features of PC-TALK.III include:

- an expanded dialing directory that increases programmable phone number space from 15 to 60,

- an increase in the number of programmable input keys from 10 to 40,

- an extended capability for selective stripping of characters as they are received during file downloading.

All program features will run at speeds of up to 1200 baud.

Previously, free copies of PC-TALK were offered to anyone who sent a formatted disk and a stamped, self-addressed envelope. Users who liked the program were encouraged to send a \$25 donation.

The new PC-TALK is available for \$35, but, demonstrating that justice prevails in the end, everyone who sent the requested contribution for the previous version will receive a voucher good for \$25 off the new program. Other PC owners who want to buy PC-TALK.III should not send blank disks to Freeware. They should send a \$35 check (payable to Freeware) to Headlands Press and include a return mailing address.

—Katie Seger

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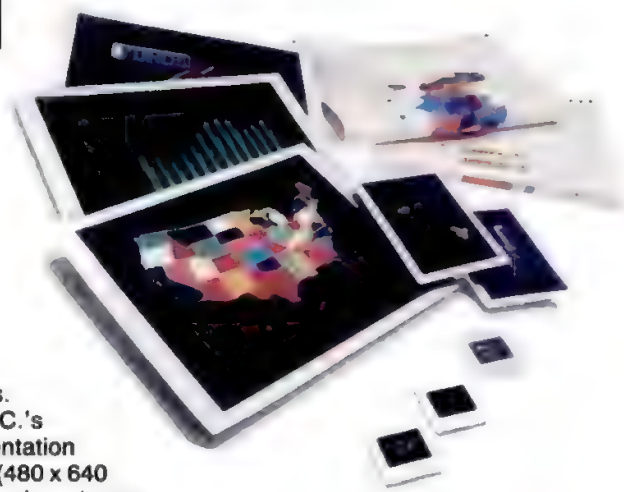


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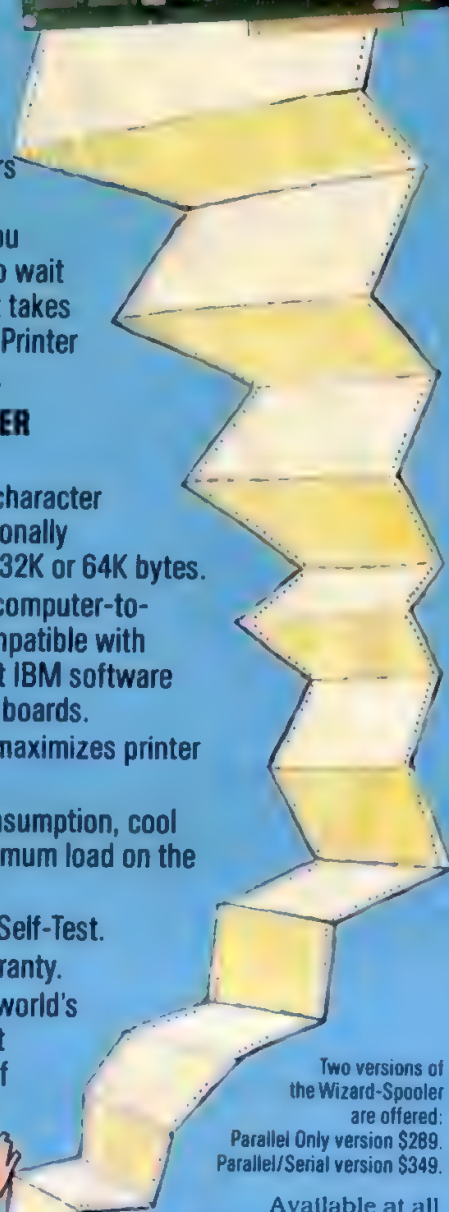
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CIRCLE 470 ON READER SERVICE CARD

The Exit menu proved to be a very useful PCMODEM feature because it allows printing or reviewing downloaded files without exiting the program. But you have to have a good memory for file names if

THE EXIT menu allows printing or reviewing downloaded files without exiting the program.



several files are downloaded in a single session, because the software does not provide a command to list a disk file directory.

Software Limitations

PCMODEM is written in BASIC, so it cannot be used to transfer true binary (machine language) files. Either 7-bit or 8-bit ASCII files can be transmitted or received, but compiled or assembled machine code files interact with BASIC and cause file transfer errors.

The software also offers no provision for batch mode operation or special file handling. Disk files cannot be renamed, copied into new files, or deleted without interrupting a communications session and exiting PCMODEM. Another feature not provided by the software is the ability to load and run a downloaded program; to test a downloaded program one must first exit to DOS.

Memory management is another PCMODEM shortcoming. Operating at 1200 baud requires the compiled version of the software, but that version will not load into a 64K system. The interpreter

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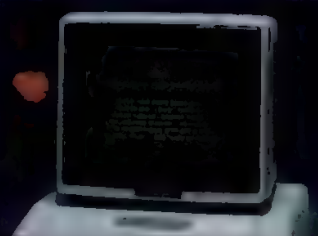


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version presumably loads into a 64K machine, though it leaves very little memory for the communications buffer. To make



MEMORY management is another PCMODEM shortcoming.

adequate use of the software, a PC must have at least 96K RAM, presenting a problem for new PC owners who have not discovered the virtues of big memory.

PCMODEM provides good error handling. When an error occurs, a message appears with a listing of the error number and the probable cause of the error. After reading the message, a simple carriage return takes you back to the menu that was being used when the error occurred. This is a big improvement over earlier PCMODEM versions that sometimes left the user hanging when an error occurred.

Documentation

The 17-page PCMODEM documentation manual is a brief but well-written guide to operation of the software. It contains complete installation instructions and an explanation of each command. The manual explains the use and updating of the telephone dialing directory in adequate detail as well as procedures for changing the program's default communications parameters. The documentation is too short to be considered a communications learning tool, but it does suffice for users already familiar with asynchronous communications buzz words.

The PCMODEM documentation manual indicates that a 3K communications buffer should be used with the uncompiled source program, but the buffer size included in the compiled version is not

documented. The BASIC source code is also not included on the PCMODEM disk as indicated in the manual. When contacted by telephone, the software publisher indicated that the source code could be ordered at a cost of \$5 and that the compiled version communications buffer is also 3K. The publisher also indicated that a larger buffer would be installed by the program author upon user request.

Summary

PCMODEM is basically a conversation-oriented communications program. Though it does not provide all of the fancy

features offered by its assembly language cousins ASCOM and CROSSTALK, PCMODEM does offer the home user most of the features needed for conversing with and transferring files between the PC and other microcomputers, bulletin boards, and information services like The Source, CompuServe, and Dialog. PCMODEM's auto-redial feature and its easily modified telephone dialing directory make it an excellent investment for the hobbyist. Many business applications of asynchronous communications, however, will require capabilities that PCMODEM does not provide. /PC

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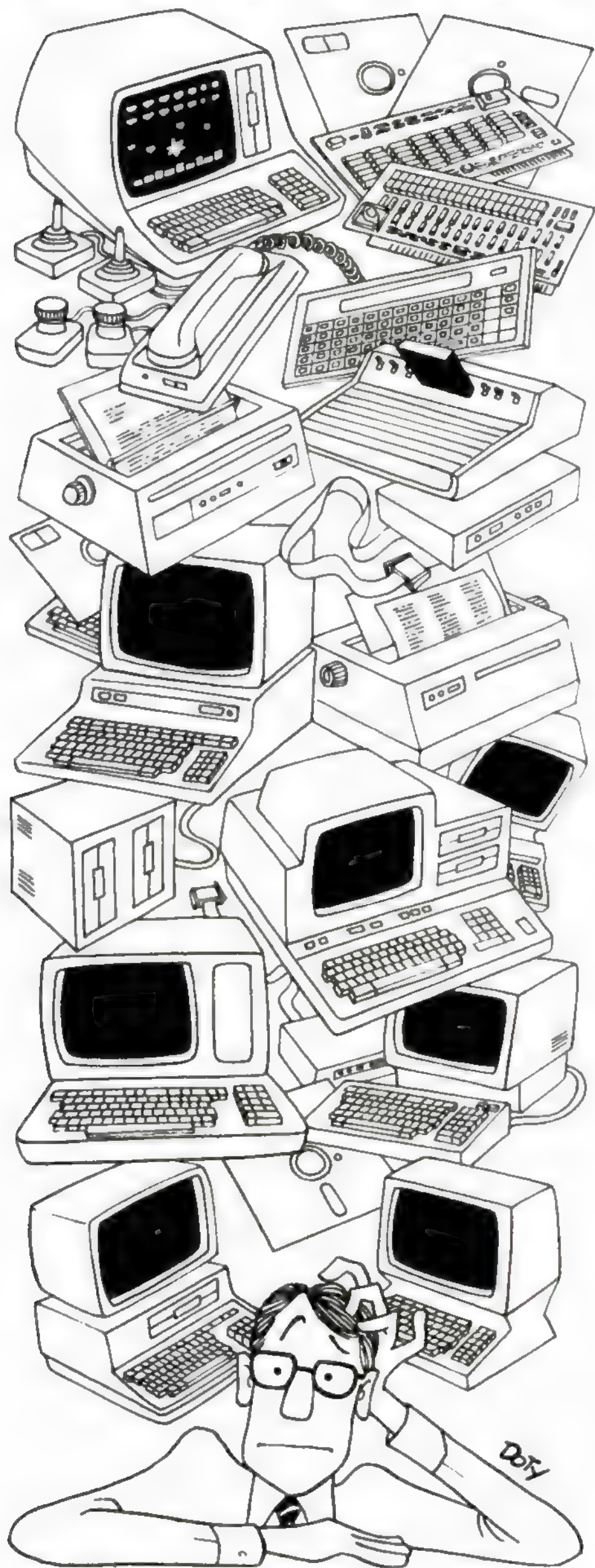


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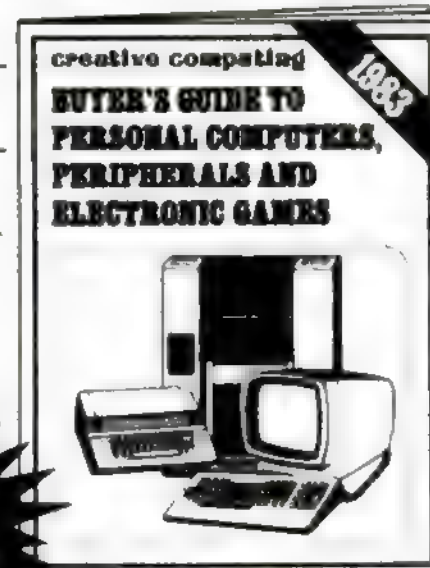
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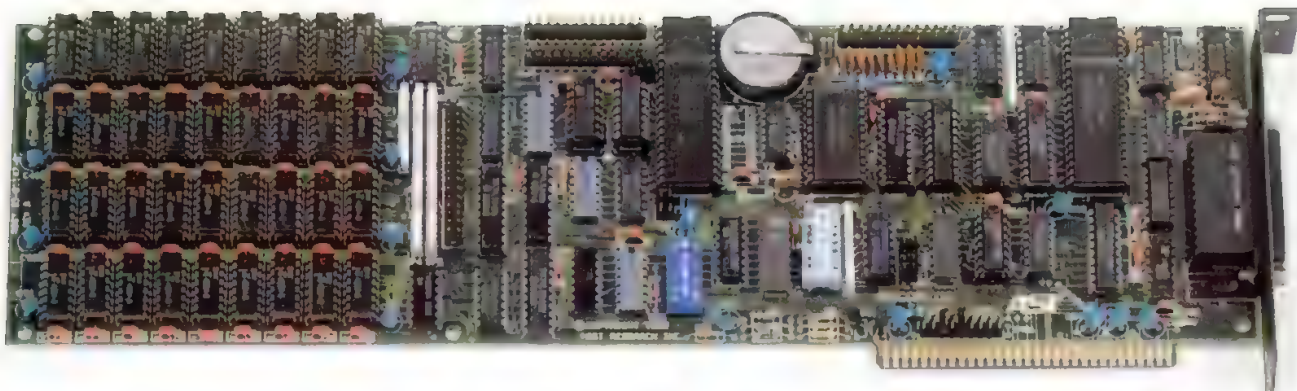
Crosstalk is a mature communications program that has already established itself in the CP/M community. Microstuf's release of *Crosstalk* for the IBM Personal Computer means that PC users running MS-DOS now have access to this popular

communications package.

While most of the new applications programs written for the PC are menu driven, *Crosstalk* is essentially a command-oriented program. However, a Help menu presenting a detailed description of each command is available. Consequently, users already familiar with other data communications programs should have little trouble walking themselves through *Crosstalk*. Users new to the field of data communications will probably find the go-

ing a little rougher.

Organizing a program for data communications presents a sticky problem: How does the program determine whether the information the user is keying in is data to be transmitted over the communications line or a command to the program to perform an action—say, taking the modem off-hook? In order to differentiate between these two types of potentially identical-looking inputs, *Crosstalk* defines two states: a command state and a terminal



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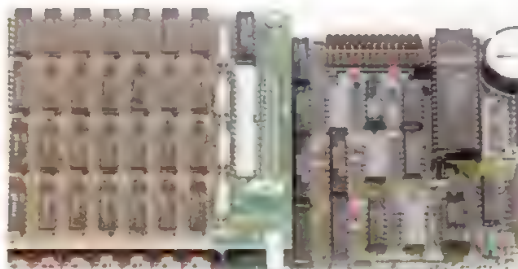
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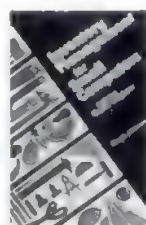
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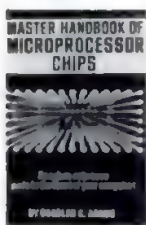
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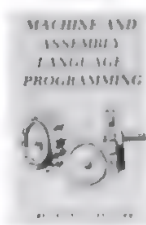
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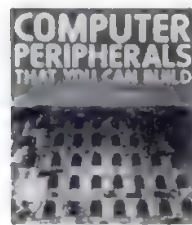
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state. In the terminal state, Crosstalk assumes all input is simply data to be transmitted; in effect, it makes the PC behave like a dumb terminal. In the command state, Crosstalk does not transmit the input. Instead, it responds to valid com-

stalk back and forth between the two states. The program responds with the "Command?" prompt when expecting a command.

Ease of Use

Once familiar with the basic commands, users should find that Crosstalk is easy to use. After it is loaded (by typing XTALK in response to the DOS prompt), the program responds with the "Command?" prompt. At this point, the quickest way into terminal mode is to enter a dialing command like the one above; Crosstalk will signal its acceptance of the command by returning the "Command?" prompt. The user enters a carriage return and the program issues the proper commands to the modem to dial the number. It then waits for the high-pitched answer tone of the remote modem, issues a "Connected" message, and switches to terminal mode.

Performing that routine with the popular Hayes Stack Smartmodem revealed a disappointing quirk. The Smartmodem's

internal switch settings must be changed from the factory default settings for it to run with Crosstalk. While this is not a ma-

CROSSTALK'S ability to store about two dozen different commands in a single command file offers convenience to the frequent user.

mands—for example, NU T555-1212—by performing the requested operation, in this case dialing a number on the auto-dial modem. Pressing the Esc key toggles Cros-

CROSSTALK provides an option that allows users to edit data while they are actually receiving it.

talker. It does mean that when users implement other communications programs—most of which run with the default settings—they must do an awful lot of switch flipping. This seems like a very inconvenient way to design a program, particularly because the only modem Crosstalk can autodial is the Hayes Smartmodem. The program will work

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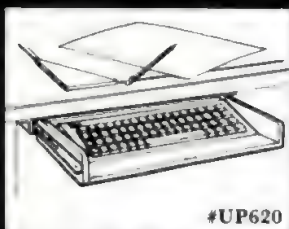
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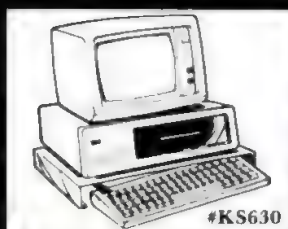
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with other autodial modems, but it cannot dial them. (A few manufacturers are now producing modems that mimic the Smart-modem's command set. *Crosstalk* should be able to dial these.) The manual includes clear instructions describing how Debug can be used to configure *Crosstalk* for use with other modems.

Debug can also reconfigure the default options of *Crosstalk*. As delivered, the program defaults to a character format consisting of 8 data bits, no parity, and 1 stop bit. Instructions are available for patching the program to use 7 data bits and even parity or some other combination. The patch operation needs to be performed only once. After it's patched, the reconfigured *Crosstalk* can be stored to disk and used again.

Programs written in interpreted BASIC are relatively slow, and therefore limited in the maximum baud rate they can support. *Crosstalk* is not written in BASIC and it's fast. It can handle communications lines up to 9600 baud. Since many of the other currently available communications programs are useful only to 1200 baud, users contemplating high-speed transfers—in a direct computer-to-computer link, for example—might find that *Crosstalk* fills the bill very well.

Command Files

Experienced users frequently prefer command-driven programs to menu-driven ones because they are much quicker. Rather than wading through a lengthy se-

CROSSTALK
allows users to toggle
the buffer storage
process on and off.

ries of menus, command-driven software lets users issue a series of commands that take them right where they want to be. *Crosstalk* takes particularly good advantage of the efficiency of command-driven software by allowing the user to predefine a whole list of commands via a command file. For example, *Crosstalk* allows users to create files containing the command to

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dial a frequently-called phone number. This relieves users of the burden of repeatedly entering the dial command. The file could also include commands to set the character format, transmission speed, and any other necessary parameters. If sign-on messages were required, they could be stored in the file as function key

BLOCK *transfers offer several advantages.*

definitions. This allows users to set transmission parameters and dial the number simply by recalling the command file. Crosstalk's ability to store about two dozen different commands in a single command file offers a great deal of time saving convenience to the frequent user. Command files can be created within Crosstalk, or outside by using editors such as EDLIN.

On-line Editing

One of the advantages of using a micro-computer rather than a dumb terminal for communications lies in its flexibility in altering data flow—storing data to disk, displaying it on the screen but not storing it, transmitting from a file or from the keyboard, and so forth. In addition to the standard options of receiving data to a disk file and/or to the screen, Crosstalk provides an option that allows users to edit data "on the fly"; that is, while they are actually receiving it. It does this by providing two options for storing received data: writing it directly to disk, or storing it into a memory buffer and then writing the buffer to disk.

The advantage of storing the data in the buffer before it is written to the disk is that Crosstalk allows users to toggle the buffer storage process on and off. This could come in particularly handy when receiving long files. If only part of the file is of interest, the user simply toggles the buffer on when receiving the desired data and toggles it off the rest of the time. While this is a useful feature, there's a glitch in the way Crosstalk captures the data in the buffer. No indicator is provided to show when data is being captured and when it's being tossed in the bit bucket. Crosstalk's

author missed a good opportunity by not using the status line of the PC display to indicate capture status.

When writing data directly to the disk, Crosstalk supports the popular X-ON (for start sending) and X-OFF (for stop sending) protocol. Should transmission be accidentally interrupted—by disconnecting the phone line, for example—Crosstalk automatically closes any opened file. Crosstalk assures that data is not lost by properly closing files under a variety of other conditions as well.

Nonstandard Block Mode

Some electronic bulletin boards and services are now using block transfer mode. This means that a number of characters, frequently 128, are grouped together into a unit called a block. A short message called a header is automatically placed at the beginning of the block. Another message, the trailer, is appended to the end. Then the entire block—header, data characters, and trailer—is transmitted with no interruptions.

Block transfers offer several advantages, particularly in the area of data correction. For example, the transmitting computer could calculate a checksum by adding together all the characters in a block, and then transmit the checksum in the header or trailer. If the receiving computer then adds all the characters it has

THE *Crosstalk manual is informative and clearly written.*

received and comes up with a checksum different from the one sent in the message, it knows there has been a transmission error. The receiving computer could then ask for the entire block to be retransmitted. It would request retransmission via a special character in the header or trailer.

The main advantage of using a block transfer protocol is to ensure that data is received accurately. There are other advantages, however. For example, because all of the characters in a block between the

header and trailer are known to be data, any of the PC's 256 characters could be transmitted without fear that the PC would interpret one of them as a special command character such as end-of-file.

A number of popular bulletin boards and electronic services have settled on one particular block transfer protocol, called the Christensen protocol, which has become a de facto standard. Unfortunately, *Crosstalk*'s block mode is incompatible with the Christensen protocol, which means that users cannot implement *Crosstalk* to access these services directly. This may or may not be important, depending upon proposed uses of communications software.

Unattended Operation

Unattended operation is a convenient feature that *Crosstalk* supports. When placed in this mode, the PC will answer a call and give control to the calling computer. The caller can then upload or download files to or from the unattended computer. Since *Crosstalk* supports the use of the wildcard character, the *, groups of

files can be easily transferred this way.

Should the need arise to exit *Crosstalk* temporarily during attended operation—

***H**OW WELL you like Crosstalk will largely depend on how well you like command-driven programs.*

to erase files or format a new disk, for example—users can leave the program via the XDOS command. When reentered, *Crosstalk* determines that an interrupted communications session was in progress and resumes where it left off.

The *Crosstalk* manual is informative and clearly written. The first part of the manual lists the ten most-frequently asked questions about *Crosstalk*. The answer to

the very first question suggests that users check the Smartmodem's internal switch settings. Apparently, Microstuf is aware that offering a program designed to run with nonstandard default settings has caused problems.

How well you like *Crosstalk* will largely depend on how well you like command-driven programs. If you're partial to menu-driven programs, you may find *Crosstalk* severely lacking in the user-friendliness department. And if you want a communications program to access computerized bulletin boards, *Crosstalk* is not for you. On the other hand, if you enjoy the efficiency of command-driven operation and want the power available with command files, you will probably appreciate *Crosstalk*. If you're looking for a program that supports data rates above 1200 baud or you need unattended operation, *Crosstalk* is worth looking into. */PC*

Richard Steck is the librarian for the Chicago area PC users group. He has been actively involved with microcomputers since their introduction over 6 years ago.

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Ethernet Comes To The PC

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EtherSeries

3Com Corporation
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Mountain View, CA 94043
(415) 961-9602

List price: EtherLink \$950, EtherShare \$11,500, EtherMail \$1,500, EtherPrint \$750

"A microcomputer on every desk!" was a slogan often heard at the dawn of the computer revolution. But until recently, "a microcomputer at every desk" did not necessarily make good sense. Companies or institutions that acquired a scattering of small computers could not realize the full benefit from their investment unless the individual computers were linked together. They needed a way for users at one work station to communicate with other work stations. To be efficient and economical, the separate computers needed to be able to share peripheral equipment for printing and external communications. Many companies desire microcomputers if they can use them in a system in which individual stations can access and process information from a central data source.

Ethernet is such a system. It creates a local area network connecting all the computer resources in an office or building. Cables, controllers, and software, manufactured by 3Com Corporation, have been available to form Ethernet systems using computers made by Digital Equipment Corporation (DEC) and other manufacturers. Now, they are available for IBM PCs.

When 3Com Corporation decided to expand its line of networking products, the computer it chose to support was the PC. This was an interesting decision, because despite its relative youth, 3Com has already established a reputation as a supplier of Ethernet hardware and support software for minicomputers and mainframes.

3Com's decision to bring Ethernet to the PC reflects the company's belief that high-powered personal computers such as the PC are making serious inroads against larger systems in offices, labs, and factories. These are the arenas in which the most use of local networking is expected. They also place the greatest demands upon performance.

Ethernet, which was created by Xerox Corporation, leads the network popularity ratings for one overriding reason: speed. The network has a very high data transmission rate of 10 megabits per second. This assures that transferring a file from a Winchester hard disk across the Ethernet is faster than accessing a file from a local floppy disk. Floppy disks transfer data at about 250 thousand bits per second;

IBM'S HABIT
of playing its cards
close to the table
makes any prediction
of its intentions a
guess at best.

3Com's Winchester disk can transfer data at 4.8 million bits per second. Ethernet's high data rate becomes even more important when several PCs need to access the disk concurrently.

In fairness to competing networks, however, a variety of conditions can cause Ethernet's actual data rate to be less than its ideal maximum data rate. For example, errors received in a message cause it to be retransmitted, thereby lowering the effective data transmission rate.

Multivendor Support

Ethernet's performance is not the only feature that attracts users. Most buyers of the system regard its multivendor support as an equally important attraction. Xerox wanted to develop a system that would become the standard for local area networks. To achieve this goal, Xerox enlisted the support of DEC and Intel. Since this powerful troika announced Ethernet to the world with lots of drum beating and hoopla a little over 2 years ago, the network has been adopted by over 30 corporations, including DEC, Intel, Xerox, Hewlett Packard, Standard Oil, Olivetti, and Transamerica.

Notably missing from this list is IBM, which has yet to make a full commitment to any local area networking standard, either its own or others. While IBM's habit of playing its cards close to the table makes any prediction of its intentions a guess at best, 3Com president Bill Krause is willing to hazard an opinion. "Three or five years down the road I think IBM will go with Ethernet." He assumes that IBM will introduce its own network first, but concludes that "since IBM would rather be right than consistent, they'll eventually support the system that the market is calling for."

Chips and Black Boxes

Multivendor support results in product compatibility as manufacturers rally 'round the standard. This widens the selection available to the buyer and stimulates competition, which helps keep prices low. It also encourages manufacturers of a diverse range of equipment—from printers to facsimile machines and from personal computers to mainframes—to incorporate Ethernet interfaces in their equipment.

The appearance of a standard network system with its array of compatible prod-



ucts implies a market large enough to arouse the interest of integrated circuit manufacturers. Once companies begin designing chips tailored to a particular standard, the cost of designing other equipment conforming to the standard drops rapidly.

This is exactly what is happening with

Ethernet. Two integrated circuit companies, Intel Corporation and Seeq Technology (an Intel spinoff), are already producing what are known in the industry as very-large-scale-integrated (VLSI) Ethernet controller chips. More companies are expected to announce similar products shortly.

The black box that 3Com manufactures to connect the IBM PC to an Ethernet is actually a circuit board, called EtherLink, that occupies one of the PC's expansion slots. Krause credits the company's use of the Seeq Ethernet chip as a significant factor in driving the cost of EtherLink below

\$1,000 and in enabling 3Com to fit all the electronics onto one board.

Seeq's development of the Ethernet chip was really a joint effort between Seeq and 3Com. 3Com contributed to the chip's "definition," and then made an advance commitment to purchase all of Seeq's production for several months. EtherLink is the first commercially implemented machine—mainframe, minicomputer, or microcomputer—to use an Ethernet VLSI chip. In any case, the gamble has already paid off; 3Com is the first company to offer true Ethernet capability for a microcomputer, and it managed to do it at a very

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The EtherSeries

3Com's Ethernet for the IBM PC, dubbed the EtherSeries, currently consists of two distinct offerings. First is the EtherLink board, which plugs directly into an expansion slot in the PC and provides the electrical and mechanical connection to the Ethernet cable; software is supplied with the board and provides the high-level support necessary to communicate with other machines in the network.

The EtherLink board is a feat of engineering in its own right. By capitalizing on the space and power savings that result from the Seeq Ethernet controller chip, 3Com has managed to squeeze an entire Ethernet controller, 2K of buffer memory, software ROM, and a transceiver onto a single board. (The transceiver couples the Ethernet controller to the Ethernet cable in much the same way a modem couples a standard communications port to a telephone line.) To plug into Ethernet, the user merely installs the EtherLink board in the IBM chassis, connects the Ethernet cable to the connector located on the back of the board, and loads the software for the

EtherLink.

3Com's second Ethernet offering is a microcomputer-based network server called EtherShare. EtherShare features a 10-megabyte Winchester disk that offers network users high-speed data transfer and a variety of network services. Despite the enticements of EtherShare, the appeal of 3Com's Ethernet system to many people is that a network can consist of as few as

**3COM IS THE
first company to offer
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microcomputer.**

two PCs, each equipped with an EtherLink board. EtherShare can be added to a small system at any time.

Software Makes It Run

Discussions about networking frequently concentrate on the hardware. But just as software is ultimately the decisive factor in a computer's effectiveness, software is also all-important in how useful a network can be. 3Com estimates that it spent three times as many man-hours de-

veloping the EtherSeries software as it spent designing the hardware, despite the fact that the software was written in C Language—one of the most powerful languages for implementing system software.

The EtherLink software is designed as a transparent operating system; it overlays PC-DOS. As a result, users of EtherLink will find that familiar PC-DOS commands can now be used as easily to access remote resources across the net. For example, they can transfer a file between computers by simply invoking the Copy command, or the screen can be printed on a remote printer by pressing the PrtSc key. Similarly, applications programs need not be changed to make use of remote resources. All the user must do to communicate with other stations on the network is to establish a channel using EtherLink commands; from then on, the resources of the remote station respond as if they were situated locally.

Hardware is only one of the resources that can be shared via a network. Just as important is the sharing of applications programs and data developed by other users. Toward this end, 3Com has ensured data transparency with applications programs. This means, for example, that spreadsheet models developed using VisiCalc, or text written with Wordstar, can be accessed or printed across the network with no change in the applications programs.

Sharing resources does have one drawback: For a PC's disks or printer to be accessed by a remote computer, the PC must be dedicated to the task of serving other computers on the network. It cannot operate independently and run its own programs until it is released from its role as dedicated server. Fortunately, a single PC can act as a server to many stations on the network, providing the others with access to its resources (printer, disks, etc.) in a serial fashion, one PC after the other.

3Com has attempted to inject a healthy dose of user friendliness into its programs and commands. Unlike PC-DOS, 3Com's software includes a Help menu that can be called at any time. This menu displays and describes all the commands. Other features, such as prompts that appear when command parameters are omitted, contribute to the system's ease of use.

EtherShare

Although a minimal network can be established with only two PCs equipped with EtherLink boards, the real economies of scale come into play when the network

is expanded to include 3Com's EtherShare network server. Built around an Intel 8086 microprocessor with one-half megabyte of RAM and an integral 10-megabyte Winchester disk, EtherShare supports 20 to 40 users with high speed Winchester disk storage, printer sharing and spooling, and electronic mail facilities. Like EtherLink, EtherShare is designed to be used trans-

ity of the Winchester into floppy-disk sized areas called virtual disks or volumes, which may be accessed by any computer on the network. Each PC may access up to four virtual disk volumes from any combination of EtherShare volumes and local disk drives. In order to prohibit unauthorized access to disk volumes, each may be designated as either public or private. Public volumes may be read by any user. A private volume is accessible only to its owner and those users who know the password.

Data security is always of paramount concern in shared resource systems, so EtherShare includes two different types of password protection. In addition to the scheme described above, the network can be configured so that each user must have a password just to log on to EtherShare.

Once logged on, the user will find that the additional EtherShare commands are a natural extension of familiar DOS commands. For example, EtherShare adds such commands as Link and Create. Create produces a new EtherShare volume. The effect of Create is equivalent to load-

***H**ARDWARE is only one of the resources that can be shared via a network.*

parently. Once a link has been made to a desired resource, all the familiar PC-DOS commands and procedures can be used.

With EtherShare many PC users can share the fast high-capacity Winchester disk and the data contained on it. EtherShare software divides the storage capac-

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ing in a new disk and running Format. Link is another important EtherShare command. It establishes a connection between a standard DOS drive (a:, b:, c:, or d:) and any desired EtherShare volume; it is roughly equivalent to loading a disk into a specified local drive. After a Link is established, users can refer to files on the virtual disk by using standard DOS file names.

The Mail Is in the Ether

In addition to disk sharing, EtherShare offers printer spooling and electronic mail. EtherPrint implements a printer spooling capability that is transparent to

the applications program; once the print command is given, the user can immediately continue local processing. EtherPrint will support one or two printers.

EtherMail, which sports an integral editor for composing messages, controls the reception and distribution of messages among PC users on the network. EtherMail is actually two modules; one runs on the EtherShare network server, the other on the individual PC. Again, ease of use was a prime design goal. Commands to the message editor are inputted with the function keys, and the purpose of each function key is always shown on the screen. A

Help menu is available at any time.

The editor, though billed as no more than a message editor, has many features usually found only on a word processor. For example, in addition to its basic and easily learned features, the editor offers word wrap and right margin justification. The editor allows messages to have any DOS file automatically appended. Mail may be addressed to individual users or

IN ADDITION
to disk sharing,
EtherShare offers
printer spooling and
electronic mail.

sent to a distribution list. The eight self-explanatory EtherMail commands include Get Mail, Print A Message, and Reply To A Message.

Meeting the Design Goals

Despite the generous portion of state-of-the-art technology embodied in 3Com's Ethernet products, the company has managed to keep the price down to earth. For example, an EtherLink board and associated software is priced at \$950. Therefore, a working network—of, admittedly, only two PCs—can be established for \$1,900. With the addition of EtherShare, a full-blown network of 20 users would cost less than \$1,700 per station. Buying the system should prove to be no more difficult than buying an add-on RAM board. As a matter of fact, both can be purchased from the same distributor, Tecmar.

While at first glance it might seem odd that a relatively small company like 3Com has become one of the leading implementers of Ethernet systems, there is a very good reason. While still at Xerox, 3Com founder Bob Metcalfe was the principal inventor of Ethernet. 3Com designed its Ethernet system in keeping with Metcalfe's five criteria for a successful network: plenty of applications software, a low connection cost, ease of installation, high performance, and multivendor compatibility. The resulting products are concrete evidence of how well one company has met its goals.

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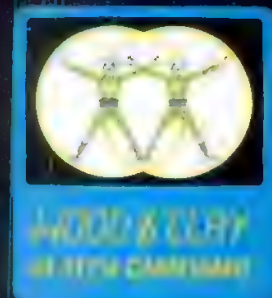
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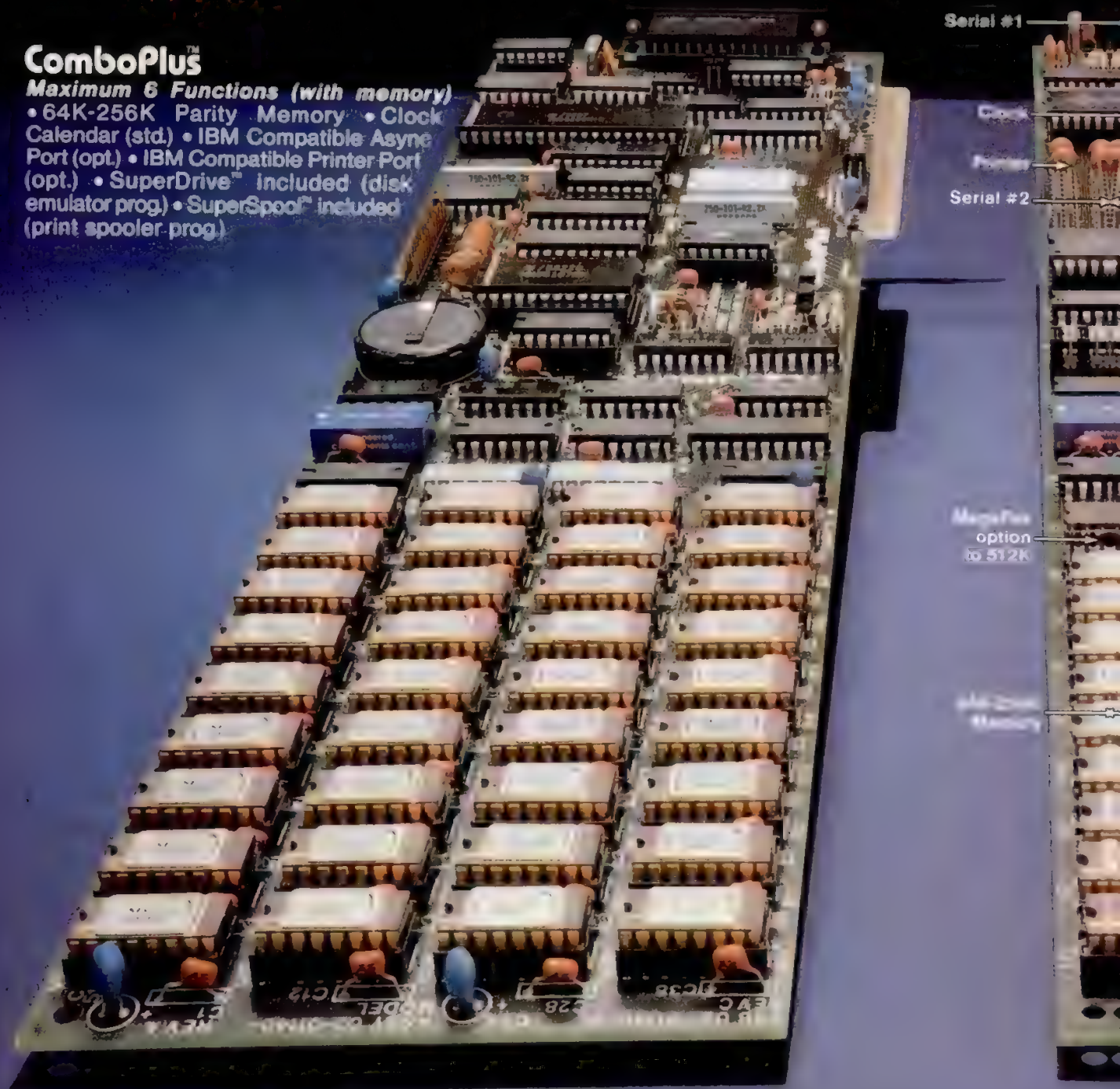
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net will become the next local area net-
work standard, Nestar Systems Incorpo-

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that the network was no longer proprietary. After that declaration, any company could freely incorporate Arcnet into its own products. Despite its quiet beginning, the network has a number of factors that make it a worthy contender for the network standards title.

Arcnet is very likely the most popular system now used in more than 5,000 separate office networks throughout the world. One reason for its popularity is the head start Arcnet had over its competitors; Datapoint started shipping Arcnet in 1977. (Ethernet wasn't officially announced until 1980, and its hardware didn't appear until 1981.) A major expansion of Arcnet's user base came last year when Tandy Corporation announced that it had adopted Arcnet for its Radio Shack Model II and 16 computers.

That head start endowed Arcnet with several significant advantages. Because the system has been in use for so long, all its subtleties are well understood, and the bugs have been thoroughly shaken out. Integrated circuit controller chips for Arcnet have been available for a year, greatly reducing the cost of network hardware.

A FILE *server of half a gigabyte implies the ability to service a large network.*

Arguments will continue to whirl concerning the respective merits of Ethernet versus Arcnet, particularly over the question of transmission speed. Arcnet uses a token-passing system that runs at 2.5 million bits per second, while Ethernet uses a scheme that goes by the tongue twisting name *carrier sense multiple access with collision detection* (abbreviated CSMA/CD), and runs at 10 million bits per second. These figures, however, represent theoretical maximum data rates, not the effective data rates. Due to factors arising from the intricacies of each installation, the effective data rate on Arcnet possibly could be higher than Ethernet, which has a higher ideal maximum data rate.

Despite the obvious differences between Arcnet and Ethernet at the hardware level, Nestar's Plan 4000 offers an unexpected feature. Though it is an Arcnet network, it is entirely compatible with Ethernet's upper level software, such as applications programs. (Standards for networks are set for seven different levels, or layers, by the International Standards Organization.)

Vast Networks

When Nestar Systems Corporation builds a network, it doesn't fool around. The Winchester disk capacity supplied with the company's new Plan 4000 network starts at 60 megabytes, and increases to well over half a gigabyte, 548 million bytes to be exact. Why such voluminous storage capacity on a network designed for microcomputers?

"We have been in the network business for over 3 years," explains Peter Hertan, vice president of marketing at Nestar, "and we know the needs of our users." Hertan feels that companies incorporating only 5- and 10-megabyte Winchesters in their network file servers are lulling their users into a false sense of security. According to Hertan, the file server will have to be fairly large; with the price of Winchesters dropping, more users will be running a 5- or 10-megabyte Winchester local to their PCs.

A file server of half a billion bytes implies the ability to service a large network. Buyers of Nestar's Plan 4000 will not be disappointed in this respect. The network was designed to support up to 255 stations without significant degradation in response time. Those stations may be any combination of IBM PC, Apple II, Apple III, Datapoint, or Radio Shack Models II or 16—an assortment that Hertan believes should please a lot of users.

The Four Mile Run

A close look at some of the specifications of Nestar's Plan 4000 reveals that it looks like a remote area network, though it is called a local area network. This is because the maximum distance between any two nodes on the network can be as much as 4 miles.

The concept of a node does not explicitly appear in Ethernet, which instead makes a simple T-connection between the network cable and the station. Arcnet uses

a more complex node scheme in which each station connects to the cable through a black box called a line isolation device (LID). A LID has provisions for up to ten connections, nine to individual stations and one to the next LID, or ten to individual stations if the LID is at the end of a chain in the network. Each LID with its associated stations is referred to as a net-

THE MAXIMUM *distance between any two nodes on the network can be as much as 4 miles.*

work node. If you could look down at the layout of stations attached to an Arcnet, you would see something like a series of starbursts, with each star corresponding to a node. In Nestar's Plan 4000, the network server itself contains an internal LID with connections for up to 30 stations. To add more stations, additional LIDs are placed on the network wherever they are needed.

Although they add a certain amount of cost and complexity, the LIDs perform two important functions. First, they electrically isolate stations on the node from each other, so that a problem with one station does not disrupt the network. (Ethernet deals with this problem through the design of its transceivers.) Second, each LID reconditions the signal it receives from the Arcnet cable, so that the signal leaving a LID is actually better than the signal coming into the LID from the network cable. This is in large measure why the links in Arcnet can stretch for over 4 miles.

To plug into a Plan 4000 network, a single interface card is inserted into any PC expansion slot, and a cable from the network is plugged into the card via a back-panel connector. Nestar's PC network interface card is \$595. When the additional cost of a LID is figured in—at \$1,900 per LID, the cost per station on a ten-station node is \$190—the direct cost per terminal to connect to Plan 4000 is under \$800. That \$800 figure, however, doesn't take into account the cost of the network server. Unlike 3Com's EtherSeries, Nestar's Plan

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4000 cannot be configured without a network server.

Refined Software

Nestar's objective is to sell Plan 4000 mostly to larger firms; it has targeted the Fortune 2000 companies as its primary market. According to Hertan, the network is available from Nestar only in configurations suitable to several stations. Hertan expects other companies to make smaller

NESTAR *has targeted the Fortune 2000 companies as its primary market.*

configurations available at a later date. A typical Plan 4000 configuration consists of a 137-megabyte hard disk backed up by a 45-megabyte streaming tape drive, and costs about \$24,000. Those are pretty big bucks, and for that price you would ask such a system to offer many sophisticated features.

Plan 4000 is up to the challenge. Seven server routines, ranging from file and print servers to emulators and telex servers, are already available. This extensive software support is a legacy of Nestar's ongoing experience in selling networks. Most of the server routines are virtual copies of programs that have already proven their reliability in other Nestar networks.

The file server, the workhorse of any network, is a good example of the extent and refinement of features implemented by Nestar. Nestar's file server functions transparently; standard PC-DOS commands access resources from across the network as easily as they access local resources. File servers will initially support both IBM's PC-DOS and the UCSD p-System, with support to be introduced later for CP/M-86. The early and unexpected availability of support for the p-System is a byproduct of Nestar's having written its server software in Pascal. The easy portability of the software from earlier networks to the new system can also be attrib-

uted to Nestar's foresight in using a portable language like Pascal.

Nestar's file server allows the PC user to establish virtual disks, or volumes, of any size on the Winchester. Virtual disk size is limited only by PC-DOS. Once a file is established, it can be protected at two levels. First, the user can define password protection that governs access according to three user categories: public, group, or private. Two different passwords can be defined per volume. For each password, five different access functions—read, write, erase, create, and delete—can be specified.

In case this is not enough protection, the file server also provides a "lock manager," which can be used in applications that need to restrict access to resources such as fields in a data base. Using the lock manager, the user can subdivide the files into fields as small as desired. Database systems that allow concurrent access by several users need a facility like the lock manager to prevent the corruption of data that could occur, for example, when one user is reading data that another user is in the process of altering. The file server also supports multiple disks, tape backup, and automatic error detection and recovery.

Closely allied with the file server is the file transfer server, a facility that allows stations on one network to send files to another network or stand-alone PC via telephone lines. The transfer server allows unattended dial-in and dial-out, while automatically logging all activity.

Talking to Other Networks

Communicating with a network via phone lines is efficient, except when the traffic volume is high. For increasing efficiency in high-volume situations, Nestar offers a "gateway server," a facility that interconnects networks at the full network data rate. This is the point at which Plan 4000's software compatibility with Ethernet comes into play. An Ethernet and a Plan 4000 network could be interconnected via a gateway server. "With the software compatibility already established, that gateway is just a matter of a card or two, a trivial piece of hardware to build," Hertan says, adding that Nestar will offer a gateway to Ethernet.

Plan 4000's print server is as refined as its other features, offering spooling and other services reminiscent of mainframes.

The user can, for example, attach a scheduling priority of high, standard, low, or overnight to the print job, and later query the printer as to the status of the print requests. Although the print server requires a dedicated PC, Plan 4000 supports the suspension of printing, which means a user can do other tasks on a print-dedicated PC at any time. When the user relinquishes the machine, printing will resume exactly where it left off. A single dedicated print server can support multiple printers.

Nestar believes that a large proportion of its networks will be sold to customers having access to mainframes; in many cases, their large computers will be IBMs. For those customers, Nestar has two additional servers: a 3270 emulator that transforms any networked PC into a virtual IBM 3270 terminal, and a 3780 emulator. The 3780 is a combination card reader, printer, and card punch for remote job entry to IBM mainframes. 3270 emulation can be very economical. It allows multiple stations to use a single modem, and ties up only one port on the mainframe.

Nestar offers training classes for both advanced users and system maintenance personnel to help them navigate through the intricacies of its high-powered Plan 4000. The company is also making a library of software modules available to users for customizing the network to specific applications.

NESTAR *has clearly done its homework in designing the Plan 4000.*

Ethernet has made a strong bid to become the prevailing network standard, but the race is still on. Nestar has clearly done its homework in designing the Plan 4000; the company's decision to go with Arcnet hardware, rather than Ethernet, was based on a careful analysis of what each network has to offer. By combining Arcnet hardware with Ethernet-compatible software, Nestar has created a system that may offer the best of both worlds. /PC

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Communication Between Micros And Mainframes

Over 70 percent of all large computer installations involve IBM mainframes and communications protocols—and the percentage is likely to increase.

We have to worry about three basics in computer communications: electrical signaling, data alphabets, and information transfer protocols. The PC uses a standard electrical signaling scheme called RS-232C. This standard is used by most data communications systems, but the PC does not share the alphabet and protocol schemes used by its Big Blue brothers. The PC uses a data alphabet called ASCII (American Standard Code for Information Interchange) to give meaning to the 0's and 1's coming out of its RS-232C serial port. The big IBM machines speak a language called EBCDIC (Extended Binary Coded Decimal Interchange Code). ASCII/EBCDIC translation must be done if the two machines are to exchange data.



IBM HAS developed different ways of arranging data so it can be handled by the applications programs.

Talking to Big Blue

The PC normally transmits data in an asynchronous protocol; each character is sent into the communications channel with its own bundle of information. The channel is assumed to be a dedicated link between the communicating parties. Character information sent into the chan-

nel includes a stop bit to signal the end of the character and possibly a parity check to ensure accurate reception. This protocol places more overhead information in the communications channel, but it uses relatively simple equipment to send and receive individual characters.

The transmission protocol normally used by large IBM systems is a synchronous scheme called binary synchronous communications (BSC), or bisync. Bisync gathers many characters and puts them into a single, large message block. The message block begins with special synchronization bits and includes station addressing information with the characters making up the body of the message, and a trailer with a parity check for the entire block. This method of transmission requires more sophisticated equipment for timing and coding, but it allows great flexibility and efficiency for high-speed transmission on a multiuser channel.

IBM developed another synchronous protocol, synchronous data link control (SDLC). This protocol is similar to bisync in that the data is gathered into blocks, but SDLC uses data bits to signal control functions instead of the full characters used by bisync. This bit orientation further reduces the overhead while maintaining flexibility.

As if this weren't enough, IBM has developed different ways of arranging the data so it can be handled by the applications programs. These higher level protocols are numbered; some common ones are 3270, 3101, and 3780.

If you need to connect your PC to an IBM mainframe, three approaches are possible. First find out if your mainframe has an asynchronous teletypewriter (TTY) port. (Consult a system manager or computer supervisor for assistance.) The IBM mainframe has been equipped to meet the needs of people such as yourself. If your

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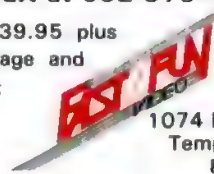
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system has such a port, you are in luck. Your standard communications card can be used with software such as *Crosstalk* to exchange data.

If the mainframe does not have a TTY port available, investigate the use of an intermediate translator. The translator can be a single piece of equipment such as one of the products made by Protocol Computers, Inc. (6430 Zariel Ave. #107, Woodland Hills, CA 91367, 800-423-5904) or Local-Data (2701 Toledo St. #706, Torrance, CA 90503, 213-320-7126). The translator can also be an extensive value-added carrier service such as Telenet or Tymnet. These service networks translate various alphabet and data protocols to and from PCs and mainframes (that's why they are called "value added"), but they have limited capabilities for translating the higher level message protocols.

The third way to connect your PC to an IBM mainframe is to modify the PC so it can communicate like its big brother, Big Blue.

Teaching the PC to Speak IBM

IBM has recently announced several hardware and software packages that enable the PC to operate as a 3270 or 3101 terminal for mainframe communications. Users who are familiar with only asynchronous ASCII terminals may be surprised to learn that IBM 3270-compatible terminals make up about 40 percent of the installed terminals in the world. The 3270 market is huge, and IBM has moved quick-

ly to give a piece of it to the PC. The 3270 emulation software is priced at about \$700. The 3101 emulation is priced at \$140 and allows the PC to operate as a 3101 Model 20 display terminal. The hardware package consists of a \$300 card for one of the expansion slots in the PC, and it provides SDLC communications capability.

Emulink, a very practical 3270 communications package for the IBM PC, consists of both a small asynchronous interface board for the PC and a program disk with emulation software. The serial board provides the PC with the ability to use bisync transmission protocol. The software performs the standard functions of an IBM 3270 display station, including computing of parity checks, routing of message blocks, responding to the host computer, and emulating the unique 3270 screen formatting functions. The software allows you to save the received data to PC disk files; it functions smoothly and provides the PC with the 27 special function keys required in the 3270 protocol.

Emulink costs \$995, but compared to the price of an IBM 3270 terminal, the PC with *Emulink* is a bargain. (Datasource, 1660 S. Highway 100, Minneapolis, MN 55416, 612-476-1300).

Emulink comes with good documentation. Installation of both the hardware and software takes only a few minutes, and preparing the PC is probably the easiest part of the job. You will have to coordinate closely with the manager of the mainframe system you want to use. You will

also have to determine the polling and device addresses to be assigned to your terminal, the type of communications line (half- or full-duplex), and the type of telecommunications service the host computer can provide. Possible options would require several hundred pages of explanation. If an experienced person is willing to help, the job will become a matter of plugging the right equipment together.

Bisync is a very different communications pattern from the asynchronous communications we often deal with in the small-computer world. The modems you may have seen or used for asynchronous communications will usually not work in a synchronous mode. Full-duplex bisync operation may be expensive because it requires two separate telephone lines (called a four-wire circuit). Bisync systems are often placed close to the main computer so they can operate at high speed over short cable runs or over paths (approximately 1 kilometer in length), using a device called a line driver or modem eliminator. A modem eliminator strengthens the direct current signals to and from the serial port on your computer, enabling them to travel over longer cable runs. This eliminator does not need to change the digital signals into analog waveforms as a typical modem does.

Once you have coordinated your system entry with the manager of the larger system, determined the communications

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willing to help, the job
becomes a matter of
plugging the right
equipment together.***

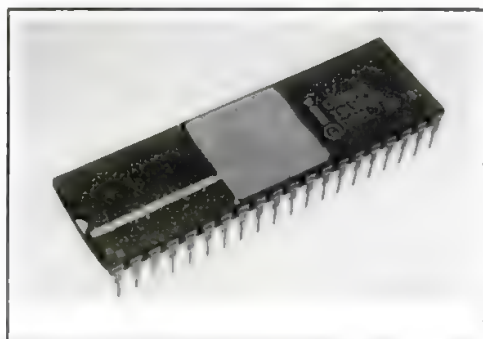
path, assigned the addresses, connected the modem, and modified the PC, you are ready to communicate. Connecting your PC directly to an IBM mainframe system may not be as easy as dialing up the local bulletin board, but the large number of IBM-compatible systems on the market ensures that many of us will want to teach our PCs to talk to Big Blue. /PC

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Turn Your Micro Into A Mini!

Computer Communications Glossary

These technical terms appear in this issue of PC. Refer to this glossary as necessary to aid your understanding of computer communications.

Acoustic Coupler—A modem that holds the telephone handset during transmission. A microphone in the modem picks up tones from the handset receiver's speaker and translates them into digital signals that can be understood by the receiving computer. Conversely, the acoustic coupler translates digital signals from the computer into audible tones. These tones are picked up by the telephone's microphone and transmitted over the telephone lines.

Analog Signal—A continuous signal that varies in direct proportion to the strength of an input signal. Telephones transmit the human voice by converting sound waves into electrical analog signals.

Answer/Auto-Answer—A modem function that senses an incoming ring signal on the telephone line and automatically connects the modem to the line.

ASCII (American Standard Code for Information Interchange)—A world-standard computer and communications code adopted in 1968 that uses combinations of seven bits to represent 128 letters, numbers, symbols, and commands. IBM added an eighth bit to the standard ASCII code to permit twice as many characters (256) to be represented on the PC.

Asynchronous Transmission—A method of transmitting individual ASCII characters that permits arbitrary spacing between characters.

Autodial—A modem function that enables a modem to dial telephone numbers.

Bandwidth—The difference between the highest and lowest frequencies a transmis-



sion channel can carry. A standard telephone line generally can carry frequencies between 300 and 3,000 hertz (cycles per second), providing a bandwidth of 2,700 hertz.

Baud—A unit for measuring data transmission rates. Transmission speed is generally measured in bits per second (bps). For example, at 300 baud, 300 bits are transmitted per second.

Bell 103—A protocol standard developed by Bell Telephone for modem communication at speeds below 300 baud.

Bell 202—A protocol used by modems for half duplex transmission at speeds up to 1200 baud.

Bell 212—A protocol used by modems for full duplex transmission at speeds up to 1200 baud.

Binary—The fundamental number sys-

tem used with computers. Binary numbers are represented by only two numerals, 0 and 1. The binary system is necessary because electrical circuits store and sense only two states: ON and OFF.

BISYNC (Binary SYNchronous Communication)—A method of transmission protocol normally used by IBM mainframes. BISYNC gathers together a number of message characters and puts them in a single large message block that includes special characters, synchronized bits, and station addressing information.

Bit (binary digit)—A unit of information that designates one of two possible values. A bit is usually written as a 1 or 0 to represent the ON or OFF status of an electrical switch.

Digital Signal—A series of electrical impulses that carries information in computer circuits.

Direct Connect Modem—A modem that plugs directly into a telephone outlet, bypassing the handset. It enables users to send and receive signals directly to and from telephone lines (see Acoustic Coupler).

Dumb Terminal—A terminal that consists of a keyboard and an output device such as a printer or a screen. A dumb terminal is used for simple input/output operations and is not capable of processing information.

EBCDIC (Extended Binary-Coded Decimal Interchange Code)—A standard communications code consisting of an 8-bit coded character set. The code is used pri-



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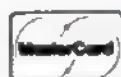
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marily by IBM mainframe computers.

Full Duplex—A method of communication between two computers that enables simultaneous transmission in both directions.

Half Duplex—A method of communication between two computers that allows transmission in only one direction at a time.

Handshaking—An exchange of predetermined signals between two computers or between a computer and a peripheral device such as a modem or a printer. Handshaking allows the computer to ascertain whether another device is present and ready to transmit or receive data.

Hertz—A unit of frequency equaling one cycle per second.

Intelligent Terminal—A terminal that is capable of processing information; many terminals can store and retrieve information on their own tapes, disks, and printers. An intelligent terminal can be adapted to communicate with various host computers simply by changing the protocol programmed into the terminal rather than modifying the host.

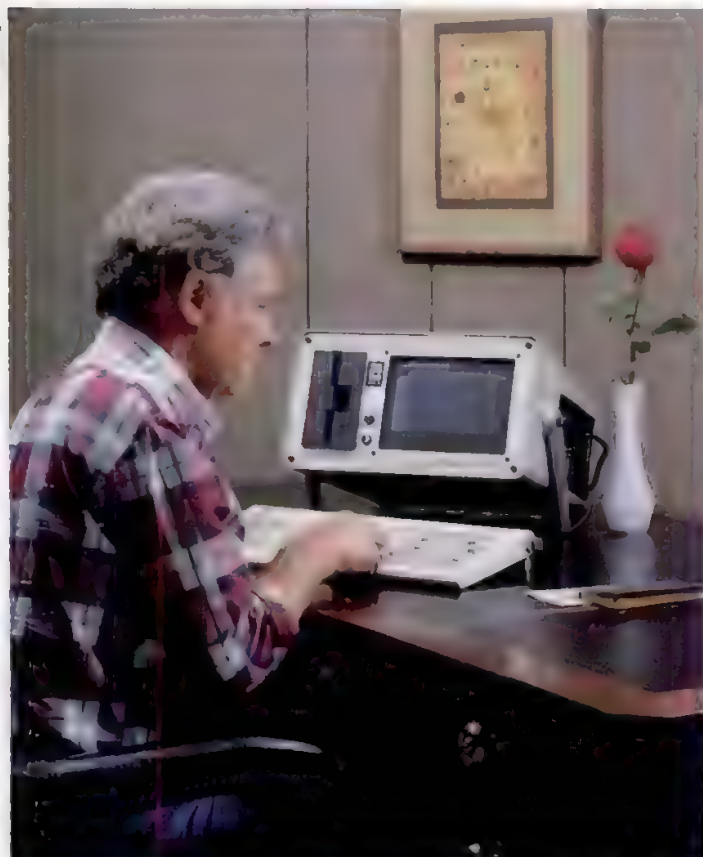
Lease Line—A permanent telephone circuit used for transmitting voice or data signals. The line is leased from a long distance telephone company (common carrier) such as AT&T, and can be conditioned to permit higher transmission speeds than a standard line (see Voice Grade Line).

Modem (MOdulator/DEModulator)—A hardware device that permits computers and terminals to communicate with each other using analog circuits such as telephone lines. The modem's modulator translates the digital computer signals into analog signals that can be transmitted over a telephone line. The modem's demodulator receives and converts analog signals into digital signals for use by the computer.

Network—A group of computers connected to each other by cables or through telephone lines. The computers can send and receive data among one another. Networking allows computers to share certain devices such as hard disks and printers.

Packet—A group of data and control bits that is switched and transmitted in a specified format.

Packet Switching—A relatively new form of digital communication in which data



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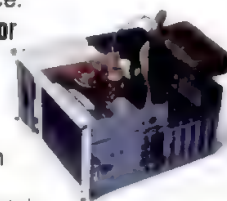
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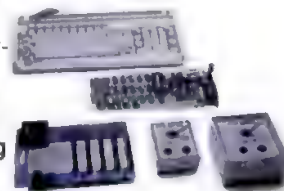


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bits are grouped into bursts (or packets) of fixed length so that they can share a channel with other such bursts. When received at the destination, the bursts are separated and sent to the appropriate recipients.

Parallel Communication—Data transmission in which a number of bits are transmitted simultaneously over separate wires.

Parity Bit—An extra bit added to a character's binary code to make it conform to the parity checking method (see Parity Check).

Parity Check—A method of error detection in data communications that checks whether the sum of 1 bits in each character received is even or odd. In odd parity, the sum of 1 bits in a character must be odd; if a character's pattern would otherwise be an even number of bits, it is transmitted with the added parity bit set to 1. In even parity, the opposite occurs; the parity bit is set to 1 for characters with odd bit patterns.

Port—An input and/or output socket on a computer used to connect hardware such as modems or cables.

Protocol—A set of rules and conventions governing the formats used in data communications.

RJ11—A standard modular telephone jack into which a direct connect modem can be plugged.

RS-232C—A standard connection for serial computer communications as described by the Electronics Industry Association (EIA). The standard specifies the physical connections between computers and other devices, such as modems and printers, and defines characteristics (such as baud rate) of the electrical signals sent through the connection.

SDLC (Synchronous Data Link Control) Transmission—A means of transmission protocol similar to BISYNC. Data is gathered into blocks, but SDLC uses data bits to signal control functions instead of the full characters used by BISYNC.

Serial Communication—Data transmission in which each bit is transmitted separately and sequentially.

Synchronous Transmission—A method of transmission in which the timing of each bit of data is precisely controlled.

Voice Grade Line—A normal telephone line designed for voice communication; it can be used for data transmission rates up to 1200 baud. /PC

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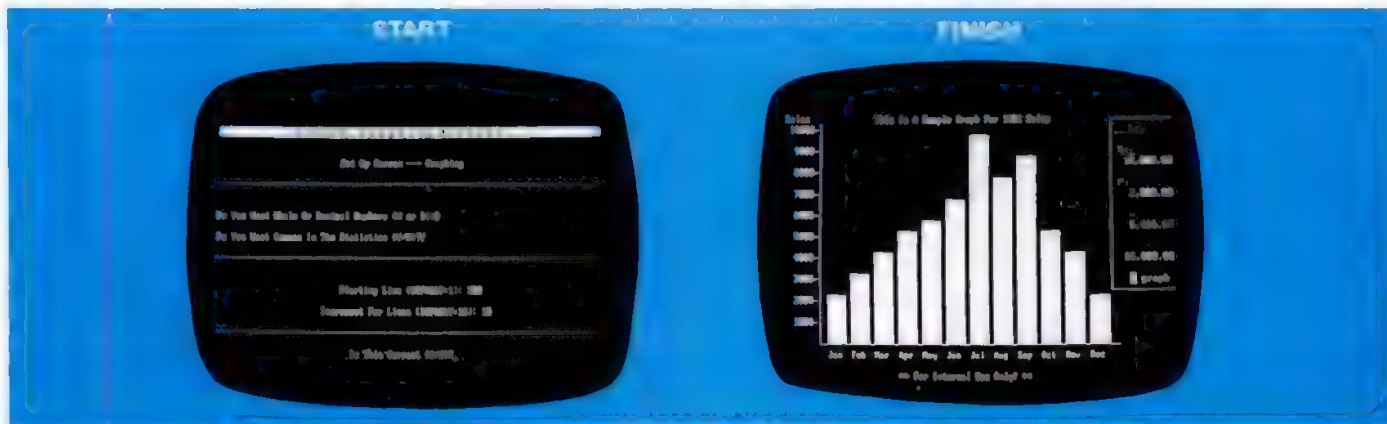
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Einmann

The two top contenders in the information service marketplace are faced off screen-to-screen for the microweight title.

Battle Of The Networks:

The battle of the networks used to be a contest between ABC, CBS, and NBC. But *network* has taken on another meaning, as the communications revolution extends to two-way communications via personal computer.

Reviewing the two reigning computer networks is a little like reviewing TV networks: one may have great news but lousy comedy, while competing networks may have equally enticing drama shows. Although there is also a great variety of programming on both The Source and CompuServe, some features are more relevant than others to PC users. These features will be compared in this article.

CompuServe Information Service (CIS), located in Columbus, Ohio, is owned by H&R Block, the income tax company. The Source Telecommunications Company, a subsidiary of the Readers Digest Association, is located in the Washington, D.C. suburb of McLean, Virginia. While CIS boasts 33,000 subscribers in the United States and Canada, The Source estimates 28,000 subscribers throughout the United States and 23 other countries. Both companies are growing at about the same rate: approximately 1,500 users per month.

Accessible from virtually any computer terminal or personal computer, both networks have a rate structure that encourages evening or late night use, and both offer services that concentrate on communications, news, finances, and reference resources.

The Source and CompuServe use large mainframe computers that serve as hosts to the thousands of microcomputers using the networks. The Source has nine Prime computers at its McLean headquarters, while CIS uses 23 Digital Equipment mainframes.

Subscription and Storage

The Source costs \$100 to join and charges \$7.75 an hour for evening use (6 p.m. till midnight) and \$20.75 for prime time (7 a.m. till 6 p.m.). Its lowest rate is \$5.75 between midnight and 7 a.m. There is a \$10 minimum monthly usage fee. Faster 1200 baud service costs \$10.75 during the evening, \$25.75 during the day, and \$8.75 after midnight.

CompuServe charges \$29 for a start-up kit that includes one free hour of evening use. After that, the company charges \$5 an hour between 6 p.m. and 5 a.m. and \$22.50

during prime time. There is no monthly minimum charge, and 1200 baud service costs \$35 during the day, \$17.50 at night. Both services charge according to the local time of the user's billing address, and both offer evening rates all day Saturday and Sunday.

Both the Source and CompuServe allow you to store data on their systems. The Source provides about 4K of free data storage and charges approximately \$.25 per K for the next 20K. It also offers quantity discounts for additional storage. CompuServe provides 128K of data storage at no charge and charges about \$17 per month for each additional 64K.

How to Subscribe

CIS subscriptions may be purchased at any Radio Shack Computer Center and many local Radio Shack stores, although CIS plans to sell subscriptions at other computer stores soon. You can begin using CIS the same day you buy the subscription.

Subscriptions to The Source may be purchased from ComputerLand and most other computer stores or directly from The

The Source Versus CompuServe



BOTH PROVIDE AN on-line "what's new" service with updates and notices about system changes.

Source. With computer store subscriptions, you are given the manual and can start using the network immediately.

Logging on to the Networks

From most parts of the country, a local phone call is all it takes to log on to either service. CIS has its own direct numbers in many cities. If you don't live in such a city, you can access it via the Tymnet access network for \$2 per hour above the normal rate. The Source can be accessed via the Telenet or Tymnet access networks at no

extra charge. Although both CIS and The Source can be accessed via supposedly toll-free 800 numbers, there is an extra charge to use those numbers. Once you reach either network, your account number and secret password are required.

Navigating around the Networks

When you first log on to either system you are asked a series of questions designed to get new users started. After that the Main Menu is displayed (see Figure 1). Both services have similar main menus,

although The Source's tends to be more complete. It includes, for example, Catalog Shopping as a separate menu option, while CIS includes it on a submenu. One feature of the CIS main menu is that it includes the Index and User Information. The latter contains several useful sections, including one that summarizes current charges and another that allows users to order documentation. The Source has similar information, but it's harder to find.

Both systems allow users to suppress the display of the menus, but you probably won't want to do that until you've worked with them for a while. Even if you do suppress the menus, they can always be retrieved. To do this on The Source, simply type MENU from command level; on CIS, type GO CIS-1.

Both networks offer a dual navigation system; you can get where you want to go via a series of interactive menus, or you can go there directly by typing a feature's address from command level. Using the menus is easier but more time-consuming—a major consideration when paying by the hour.

You can tell when you're in command level by a distinctive symbol on the screen. The Source displays a `>`, while CIS displays `!`.

Finding Your Way Around CIS

Let's say you're on CIS and you want to look at the latest edition of *The Washington Post*. Selecting Home Services from the Main Menu takes you to a menu with an option for newspapers. Selecting that option will, in turn, take you to another menu where you will find all available newspapers, including *The Washington Post*. Alternately, you can look up *The Washington Post* in the CIS index and, from command level, enter GO TWP to go directly to where *The Washington Post* begins. Although using the direct address is quicker, the menus give more information to the novice.

Finding Your Way Around The Source

The procedure for using The Source is similar to that for using CIS. The Source publishes a Directory of Services that is analogous to the CIS index. To look at something from the Directory just type in its address. You can read the American Stock Exchange daily listings, for example, by typing UNISTOX (from the printed

Directory) or by selecting Business/Financial Markets from the Main Menu. This takes you to another menu that offers several options, including Financial Markets. Select that option to get to a third menu that includes Amex Closing Prices.

Both The Source and CIS are fairly easy to use once you learn how to use either the printed indexes or the menu system. If you don't have a printed CIS menu, get one from the system by typing GOIND.

Documenting The Source

After signing up for The Source, you are given a three-ring binder with about 250 pages of attractive, thorough, and clearly written documentation. It's one of the computer industry's best user manuals. It is organized into major sections with each separated by an index divider. The sections include Figuring Your Bill; Communications Services; Source*Plus; Business; Catalog Shopping; Education and Careers; Government and Politics; Home and Leisure; News and Sports; Science and Technology; Travel, Dining, and Entertainment; and Creating and Computing.

Some of the features listed in the manual are no longer available on the network. This is not so much a case of false advertising as an indication of how rapidly the service is changing and the inability of the printed word to keep pace. The on-line menus and documentation are up-to-date.

CIS Documentation

CIS subscribers are given a 23-page User Guide. Although it is punched with three holes, a binder is not supplied. The CIS documentation provides a general overview of the system and explains how to log on. It is not detailed, and it provides little concrete information. Because the system is so easy to use, however, extensive documentation is not critical.

One excellent feature of the documentation is a flow chart that shows all the menus and how they interrelate with the services. This gives the user a good sense of how the system is organized. The CIS manual, like The Source's, is divided into sections that correspond to the features. These include General Information; Logging On and Off the System; Helpful Features (error correction, control characters, operator messages, etc.); The Menu Structure; and a little about the areas of the system (Personal Computing Services, Home



USERS HAVE ACCESS
to millions of dollars of equipment,
software, and data.

Figure 1: The main menu as displayed after logging on to each network.

COMPUERVE MAIN MENU	THE SOURCE MAIN MENU
1 Home Services	1 NEWS AND REFERENCE RESOURCES
2 Business & Financial	2 BUSINESS/FINANCIAL MARKETS
3 Personal Computing	3 CATALOGUE SHOPPING
4 Services for Professionals	4 HOME AND LEISURE
5 User Information	5 EDUCATION AND CAREER
6 Index	6 MAIL AND COMMUNICATIONS
	7 CREATING AND COMPUTING
	8 SOURCE*PLUS

Services, Business and Finance, Index). In addition, users are sent the latest version of the CIS index. Since CIS and The

Source are always adding and dropping services, the indexes should be updated with on-line information.

Documentation Updates

Both The Source and CIS send periodic mailings to their users. Subscribers to The Source receive a monthly newsletter, and CIS offers a general interest magazine called *Today* as well as a newsletter called *Update*. Both *Today* and *Update* periodically feature a new version of the CIS index. Both services provide an on-line "what's new" service with updates and notices about system changes, new features, and times when the services will be unavailable.

The Source and CIS offer toll-free numbers with people trained to answer user's questions. The Source's 800 number operates 24 hours-a-day.

Source Electronic Mail

Electronic mail is The Source's most popular feature. The mail system is sophisticated and easy to use. Typing MAILCK from command level checks your mailbox for messages. The system then reports the number of letters that have already been read as well as those unread. It also indicates how many are Express, that is, marked by the sender to be placed at the top of the mailbox. Unlike the postal service, The Source does not tack on extra charges for express mail, and mail is delivered instantly.

To read your mail, type MAIL R from command level. After reading the first letter, you are asked for Disposition. With this you can file, delete, or reply to the letter, forward it to another subscriber, or any combination of the above. To answer, type REPLY and simply enter the text. The reply procedure, except for initiation, is identical to the Mail Send feature.

Sending Source Mail

Mail may also be sent from the command level. To do this, type MAIL S, and you will be asked to specify the account number of the recipient.

Once a recipient is indicated, you are prompted for a brief subject line (no more than 32 characters). The text you subsequently enter may be as long as necessary and may include carriage returns and almost any other syntax. At the end of the letter, type one or more dot commands to specify what you want done with it. Before sending the letter with .S, consider whether you want to send a copy to someone else (naturally, that's .CC), send it express (.EX), or save a copy on your own Source



THE SOURCE
and CIS offer toll-free
numbers with people
trained to answer
users' questions.

disk space (.SAVE FILENAME). You may also request an acknowledgment, in which case you'll be notified when the letter has been received.

To speed up the process, you can send a letter directly from command level by typing MAIL S and the recipient's account number. To send a letter to me, for example, type MAIL S ST6191 for direct delivery to my electronic mailbox.

Sending Long Files Via Source Mail

The ability to load a file from Source disk space directly into a letter is an attractive feature of electronic mail. This makes it possible to use Mail to send long documents, as several authors do to send articles to PC. An author can compose an article by using a word processing program and then upload it to The Source via communications software. A Source file then can be created for the article, loaded into a Source letter, and delivered to the publisher instantly. This procedure, incidentally, is an inexpensive way to wire material to any destination equipped to receive

it. It costs about \$1 to send a 2,000-word article to Europe, whereas the same service via Telex costs around \$60. Overseas express mail costs at least \$20 and takes 2 days.

CIS Electronic Mail

Users generally agree that The Source provides a much better mail system than CIS. The CIS mail is more difficult to use and does not allow users to reply directly to each message.

CIS calls its mail program EMAIL (short for electronic mail). To enter the EMAIL program, type GO EMA-1 from command level or enter mail from the Communications Menu, which is accessed from either the Home Service Menu, the Business and Financial Menu, or the Personal Computing Menu. Through the User Information Menu, accounts can also be configured so that the system automatically takes the user to the mail program after logging on if there is EMAIL waiting.

Once the mail program is accessed, the Electronic Mail Main Menu offers the option to read mail or compose and send mail. To read mail, simply select the Read Mail option, and you are taken directly to your first letter. You are told if there is no mail in your box.

Once you have read the mail, you must immediately delete it, reply to it, or file it on your disk space. The Source, on the other hand, lets you keep mail in your mailbox for up to 2 weeks.

Sending CIS Mail

To reply to a letter or to send a letter to another CIS subscriber, go to the Electronic Mail menu and select the Compose Send Mail option. That leads to another menu that allows you to create a message or to send one from your disk space or work area.

Creating the message is done through one of two CIS editors. The Filge Editor is a typical time-sharing system text editor. It is powerful but not as easy to use as a microcomputer word processing program.

Selecting the Filge editor takes the user directly into the edit mode where letters can be created. Once a letter is finished, the user is returned to the electronic mail menu. Option 4, the most commonly used, will Send Message From Work Space, the part of CIS's memory used to write the letter in the Filge editor. Although any file

in disk space can be sent to another party via EMAIL, a limit of 2,000 characters makes it impossible to transmit long documents.

Bulletin Boards

The Source has a public bulletin board and classified ad program called Post. It is divided into about 75 categories corre-

THE IBM POST is a meeting ground for anyone interested in the IBM computer.

sponding to areas of user interest, including aviation, photography, and law. By far the most popular categories are those that deal with specific personal computers such as the IBM PC, Apple, TRS-80, and CP/M-based systems.

To read the IBM Post, type POST READ IBM. When last checked, IBM Post had 86 messages on it. They are filed in order by time and date starting with the one posted most recently. Users can search for notices by category, keyword, date, or user ID number.

After typing POST READ IBM from command level, the user will be asked to narrow the search, or to press Return to review all PC-related messages. Headlines (up to 32 characters) come up to indicate the contents of the notices. The user has the option to press Enter to read the message or N to skip to the next message. Like the Source Mail mailbox, Post messages are purged after about 2 weeks.

The IBM Post is a meeting ground for anyone interested in the IBM computer. It's where companies advertise discounts, people sell used equipment, ask for and provide tips, advice, informal product reviews, and programming questions. An inexpensive and practical way to sell used equipment or to get information from other IBM users, the Post costs no more than normal time charges.

To get in touch with someone who has posted a message, write a letter via Smail (Source mail) or post a public notice in the same category. Most people respond using

Smail so they don't clog up Post with private messages.

CIS National Bulletin Board

The CIS National Bulletin Board allows users to post any messages under the broad categories of Notice, For Sale or Wanted. Users can assign keywords to their notices, but there are no headlines or summaries to give an idea of what to read. To check notices, the options can either be read or scanned.

On the night checked, there were only 11 notices related to the IBM PC, a far cry from the 86 notices on The Source.

AP and Newspapers on CIS

CIS provides access to the electronic editions of *The Columbus Dispatch*, *The Washington Post*, *The St. Louis Post Dispatch*, and the *Middlesex Daily News*. You can also access the Associated Press wire service through one of the electronic newspapers.

Although the electronic editions are shorter than the printed ones, they have a wide selection of news and seem to carry the stories in their entirety. Each paper has its own procedures and format, but they all offer the normal front page, national, international, and local news, as well as sports, features, and columns.

As a pilot project, the newspaper program on CIS had *The New York Times*, the *Los Angeles Times*, the *San Francisco Examiner and Chronicle*, and the *Atlanta Constitution*. All recently decided to withdraw after the experimental period ended, a real loss to CIS subscribers.

CIS offers access to The Associated Press through the *Middlesex Daily News* and other participating newspapers. Through a structured menu, you can choose to read AP's United States News, World News, Washington News, or Sports. Once the area is selected, you are presented with a list of stories. You then can read one of the stories or press Enter for more choices. After selecting a story, one screen full of text (24 lines) is displayed, and you are asked to press Enter for another screen of texts, S for the rest of the story, M for the previous menu, or another CIS command. Pressing S (for scroll) displays the story in its entirety without interruptions. You can go directly to the AP area from command level by typing IND-52.

Source News and UPI

The Source doesn't provide access to newspapers, but it operates a sophisticated search service through United Press International (UPI). There is actually a newsroom at The Source's Virginia offices where they rewrite some of the UPI stories. Other news comes across exactly as it does for regular UPI newspaper or radio station subscribers.

It is possible to select a national, state, or regional UPI wire. Specify whether you want news or sports, and then enter a keyword, or press Enter for all stories. Entering a keyword will cause only articles containing that word to be displayed. Otherwise, it gives you the opportunity to read or scan all stories.

Like most Source features, UPI stories can be accessed either through a menu or directly from command level. You can get the sports news from Nebraska, for example, by typing UPI S NE S. The first S tells the system you want a state, the NE says it's Nebraska, and the next S stands for sports.

UPI also provides an on-line features syndicate. There are currently about 90 topics available, including "Fix-It-Fast," the "Slim Gourmet," and "TV Previews." After selecting a feature, you are asked to choose the article you want to read. It's like a giant electronic Sunday paper.

Source Financial Features

Source financial services include Unistox, which contains 168 reports on stocks, bonds, commodities, and money markets.

ELECTRONIC mail is The Source's most popular feature.

The reports, according to The Source manual, include daily averages from 11 a.m. to closing. Some of the commonly used reports include American Stock Exchange and New York Stock closings, Money Market futures, and current prices of Mutual funds.

The Source's Media General Stockvue provides an analysis of the performance of more than 3,100 common stocks traded on

the New York, American, and over-the-counter exchanges. This is a Source Plus service, which means that there is an additional charge above the normal Source connect time rates. You can access data for an industry grouping, a specific stock, or for your own portfolio. The system has data on 111 companies in the computer field alone.

CIS Business/Financial Services

Like The Source, CIS provides a number of business and financial programs. Option 2 on the main menu takes you to the Business/Financial Services menu, which provides eight services with business news and information (see Figure 2).

**CIS HAS
a public file area
where users can store
programs, data files,
and other material.**

One of these services, The Business Wire, is actually Canadian business news taken from the files of the Canadian Press Service (CPS). The CPS also provides international news from AP, Reuters, and Agence France-Presse.

The Money Market Service (MMS), according to its on-line description, "is a multi-national corporation specializing in financial and economic research." Founded in 1974, the company claims to be the largest supplier of on-line financial forecasting "with over 700 institutional clients around the world."

One of MMS's services is Fedwatch, a news bulletin written each Friday afternoon after relevant Federal Reserve data is released. The information and forecasts focus on interest rate trends that affect stocks, commodities, and bonds. MMS says that CompuServe subscribers can read Fedwatch four days in advance of recipients who receive their copies by mail.

Another service, Investment News and Views, is a compendium of advice and information about stock market investment and trading opportunities. The service provides mostly newsletters written by in-

dividuals, reflecting personal outlooks.

The Raylux Business Report is a series of articles from leading investment strategists and economists. One night the report compared the leading economic indica-

through its edition of the *Atlanta Constitution*, but that newspaper has been dropped from the service. CIS now provides travel news and information including a Pan Am guide for overseas travelers

Figure 2: Business and financial menus for The Source and CompuServe

THE SOURCE BUSINESS/FINANCIAL MARKETS

- 1 FINANCIAL MARKETS
- 2 ANALYSIS & COMPUTATION
- 3 NEWS AND COMMENTARY
- 4 PERSONAL FINANCE
- 5 RESEARCH AND REFERENCE

COMPUERVE BUSINESS AND FINANCIAL SERVICES

- 1 Business Information Wire
- 2 The Business Wire
- 3 MMS Financial Analysis
- 4 Commodity News Service
- 5 Archer Commodity Report
- 6 Stevens Business Reports
- 7 Investment News and Views
- 8 RayLux Investors' Reports

tors of 1982 with those of 1929; you can guess its conclusions.

Airline Schedules and Travel Information

The Source gives you access to a complete schedule of direct airline flights to practically any destination in the world. After typing AIRSCHED at command level, you are prompted for the departure and destination cities; you also have the option of specifying the time of day you wish to travel. If you do not request a particular time, the entire day's schedule is displayed. The data includes flight numbers, classes of service, and whether a meal is served.

With the information in hand, you can call the airline directly or use The Source to make your reservation and buy tickets. It's not possible to make a direct connection to the airlines' reservation computers (that privilege is reserved for travel agents), but you can request a reservation via the travel service by typing LETSGO. The service will make the reservations and mail the tickets. The service is run by a travel agency that gets its commissions directly from the airlines, so you shouldn't ask them to make the reservation unless you plan to buy the ticket from them. Allow 5 days to get tickets via mail or arrange to pick them up at the airport for a fee.

To use the travel service, register your name and credit card information by typing CINFO from command level and following the prompts.

CIS used to offer airline information

and a travel club offering discounts on car, yacht, and plane rentals.

CIS Reference Library

The CIS Reference Library contains movie reviews, magazine excerpts from *Better Homes and Gardens* and *Popular Science*, as well as original CIS features such as "The Future File" and the "Refundle Bundle."

The "Future File," a special set of articles prepared by CIS, includes articles on "Bioengineering," "Computers and Computing," "Telecommunications," and "High Technology." "Computers and Computing" treats you to a series of interesting, but not earthshaking, interviews.

The "Refundle Bundle" gives tips on how to save money. While this feature is

NEITHER
computer network
provides the
equivalent to
Directory Assistance.

informative, it has the same kind of advice printed in daily papers or popular magazines.

An exciting addition to the CIS Reference Library is the *World Book Encyclopedia*. Accessible from command level by

THE GIANT KILLER



Vanquishes The High Cost Of Plotters

Small, smart and cost effective, the DMP-40 single-pen plotter puts big-plotter power at the command of the small-system user. With this amiable and competent aid at your side, you can create colorful 8½ x 11" and 11 x 17" graphics—images of professional quality for stand alone use, binding into reports or as overhead transparencies for group presentations.

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By plotting in increments of only 0.005", you are assured of virtually step-free traces. The result is precisely defined graphics of high accuracy and solid repeatability.

Standard RS-232-C interfacing matches the DMP-40 to all current computers.

Multicolor plots on the DMP-40 are a simple matter since built in firmware and most commercial software provide 'pause' commands for pen changing.

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PROVEN DESIGN.

Quadram has been shipping IBM boards with each of the Quadboard functions on separate boards since December, 1981. They are still available as separates (including a Dual Port Async Board) for those who desire a quality board but do not need to keep slots open for future expansion. And they all come with a one year warranty from the leader in technology applications.

256K MEMORY EXPANSION.

Socketed and expandable in 64K increments to 256K, full parity generation and checking are standard. A Quadboard exclusive feature allows parity to be switch disabled to avoid lock-up upon error detection. The dip switches also allow it to be addressed starting on any 64K block so that it takes up only as much as it has memory installed. Memory access and cycle time naturally meet all IBM specifications.

CLOCK/CALENDAR.

Quadboard eliminates the hassle of manually inputting the date on system boot-up by providing for the clock and all software routines necessary for inserting the appropriate programs on your diskettes. The internal computer clock is automatically set for compatibility with most software routines which utilize clock functions. On-board battery keeps the clock running when the computer is off.

BY QUADRAM

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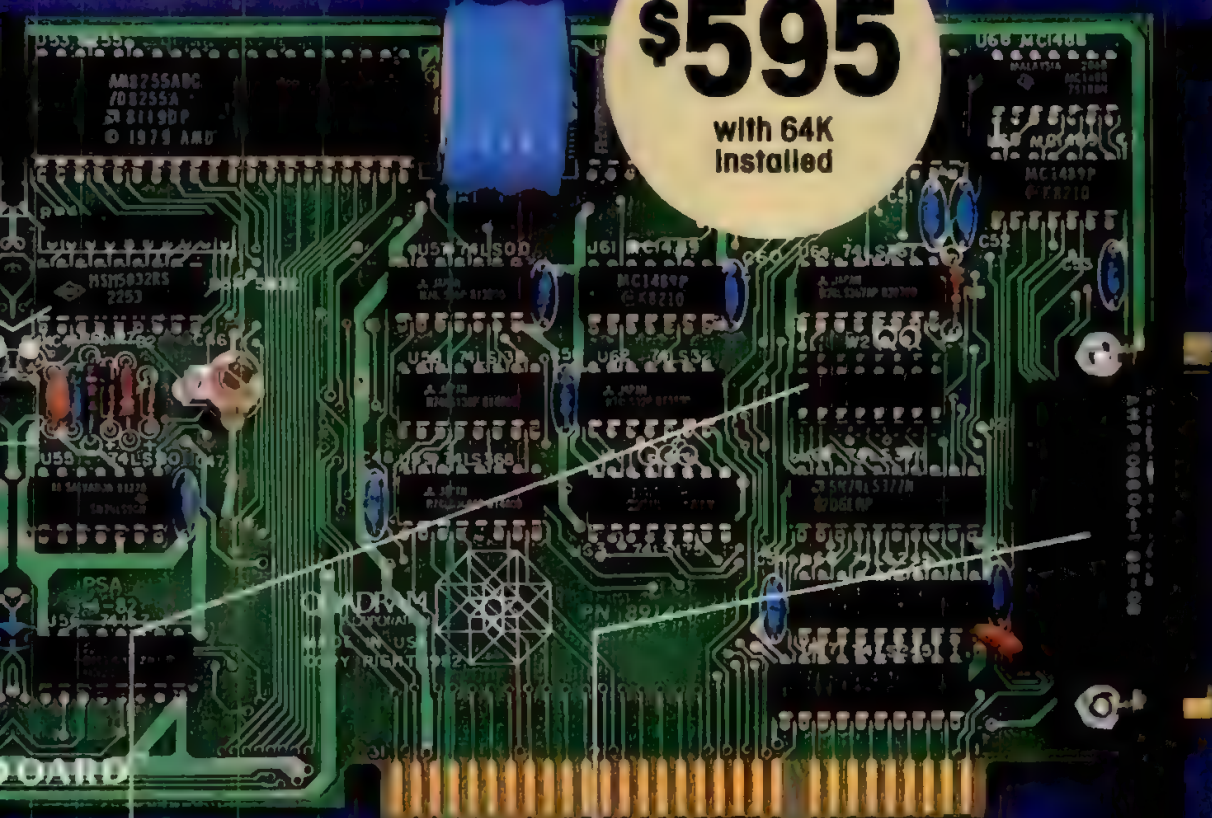
Now you can utilize all the PC's capacity with Quadram's extremely flexible configurations. And it's totally compatible with IBM hardware, operating systems, and high level languages. It's a full-size board that can be inserted into any free system slot and it even includes a card edge guide for securely mounting the board in place.

SOFTWARE TOO!

With Quadboard you receive not only hardware but extensive software at no extra cost. Diagnostics, utilities, and Quad-RAM drive software for simulating a floppy drive in memory (a super-fast SOLID STATE DISK!) are all part of the Quadboard package.

\$595

with 64K
Installed



PARALLEL PRINTER I/O.

A 16 pin header on Quadboard is used for inserting a short cable containing a standard DB25 connector. The connector is then mounted in the knock-out hole located in the center of the PC backplane. The parallel port can be switched disabled or addressed as Printer 1 or 2. No conflict exists with the standard parallel port on the Monochrome board. The internal cable, connector and hardware are all included.

ASYNCHRONOUS (RS232) COMMUNICATION ADAPTER.

Using the same chip as that on the IBM ASYNC board, the device is software programmable for baud rate, character, stop, and parity bits. A male DB25 connector located on the back connector is identical to that on the IBM Async Adapter. The adapter is used for connecting modems, printers (many letter quality printers require RS232), and other serial devices. Switches allow the port to be configured as COM1 or COM2 and the board fully supports IBM Communications Software.

INCREDIBLE PRICE!

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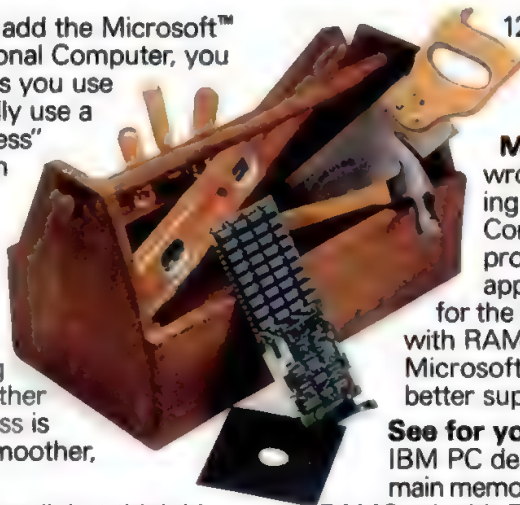
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typing GO WBE, the program gives a short and factual report on the subject indicated by keywords. By trying several keywords, we found the type of information you would expect from an encyclopedia. It had, for example, a 400-word biography of Ralph Nader and a short but informative history of IBM. Investing thousands of dollars in an encyclopedia that will soon be out-of-date seems impractical when you can electronically access a version that is updated every 3 months. For some, this feature alone will justify the \$29 CIS sign-up fee.

Bank At Home With CIS

CIS offers electronic home banking through participating banks in Massachusetts, Ohio, and Tennessee. It has expanded the service experimentally to banks in Tennessee and Massachusetts. The Ohio Service, through Huntington National Bank in Columbus, is available on a regular basis to CIS subscribers in all parts of the country. Participants must open an account with Huntington, which will add \$4 per month to normal banking charges. The bank offers a full line of banking services including checking, savings, and combined MasterCard/Visa accounts (see Figure 3). Participants may use CIS to pay their bills, check account balances, and transfer funds from one account to another. To sample this service, you can run a demonstration electronic banking program using the Home Service Menu or type GO HOM-45.

Interactive Communications

CB simulation is one of the most popular services on CIS. Users who participated in the citizens band radio craze of a few years ago will feel very much at home when they check into CIS's CB. Instead of using your voice and a microphone, you use your fingers and a keyboard to join this open-ended electronic party line. With the CB service, you get all the curt, rude, and silly comments expected from the real thing. Instead of filling the airwaves with chatter about the latest rigs, these CB sessions cover computers and developments in software and hardware.

The Source doesn't have a service like CB, but it does have a Chat mode. From command level, you can get a directory of all users who are on-line by typing ON-LINE. If you want to chat with one of the

users, type CHAT and the account number.

While CIS's CB is a beast of a different nature, it can be used for two-way conversations, like The Source's Chat mode. CB always has extra channels that can be used for private conversations, and there's even a way to exclude others from reading what you are typing or from butting into your conversation.

Granted, a phone call is cheaper and quicker, but there are some advantages to having a conversation via Chat or CB. For one, a Chat or CB session can be downloaded for a written transcript of the conversation. That's an extra the phone company can't provide.

Directory Assistance

If you need someone's phone number, you can dial 411, give the person's name, and, chances are, you'll be told the number. Neither computer network provides the equivalent to Directory Assistance. Both claim that easy access to such information would violate privacy, but I don't agree. Knowing someone's account number wouldn't give you access to the subscriber's account or files since a secret password also is required to access any account. Subscribers could be given the choice of a listed or unlisted number.

CIS has a User Directory, which is something like a yellow pages of subscribers. Listing your name (usually first name

ings and does not allow you to find subscribers by last or company names.

CIS also has a public file area called CIS Access where users can store programs, data files, and other material that can be accessed by other users. Material on CIS Access includes programs that can be downloaded for your own, although it's sometimes hard to figure out which personal computers can run the programs.

Publishing

The Source has a user publishing section in which subscribers can store their original articles, programs, or "magazines" for other users to access. Placing material in the public area pays you 9 percent of the log-on fees spent by users reading your material. One of the Public programs is called the "PC Gazette," which looked promising when it started about a year ago. It has since fallen into ill repair with its information painfully outdated. Because The Source is merely the conduit for public files, it can't be blamed for this decline. The person responsible is the system operator of that public file—a regular subscriber to The Source who chose to create the data base. Many other public files are well maintained and interesting to read.

System Response Time

In addition to examining a network's features, it is important to look at the system's response time and whether it causes unnecessary delays.

Both The Source and CompuServe use time-sharing computers, with several people using the same computer at the same time. As a result, users have access to millions of dollars of equipment, software, and data.

I have heard several Source subscribers complain about system delays and poor response time. Sometimes The Source's computers take several minutes to perform a task that normally takes less than a second. The system can "hang" on you, forcing you to disconnect manually because it can no longer accept even a command to log off. Complaints have prompted action from The Source's executives, who claim that the problems were due to a transition in their equipment and operating system (software). They have made improvements recently by installing additional computers and by revising their

HNB Personal Services

- 1 Checking Accounts
- 2 Savings Accounts
- 3 Installment Loans
- 4 Mortgage Loans
- 5 Commercial Loans
- 6 Certificates of Deposit
- 7 Bill Payment

Figure 3: A menu used by CompuServe subscribers with electronic banking accounts at the Huntington National Bank in Columbus, Ohio.

only) is voluntary. This service indicates where users live, what type of equipment they have, and their other interests. Users find each other by searching for city, equipment, interest, or name. There are 96 people who are registered as PC owners, although this does not indicate the total number of PC owners who use CIS.

The Source has a similar service called Disearch. It contains only voluntary list-

operating system.

CIS users haven't been plagued by these problems. Users say they experience very few delays and are generally pleased with response time.

Rating the Networks

To research this article, I interviewed a number of people who have used both CIS and The Source.

There are strong advocates for both CIS and The Source, though more people favor The Source than CompuServe. Although I use CompuServe enough to feel that I get my money's worth, I find myself using The Source more often. The Source's electron-

ic mail and IBM Post bulletin board are services I use daily.

Nevertheless, there are compelling reasons to subscribe to CIS as well. The initiation fee of \$29 is much lower than The Source's. And since there are no minimum use fees, users pay only for the time they use. The Source's higher initiation fee and \$10 monthly minimum make it a bigger investment.

Before passing judgment, it is important to realize that both networks are constantly revising their services. A few months ago, CIS lost points by dropping the *New York Times* and other newspapers but recently raised its score by adding the *World Book Encyclopedia*. Source of-

ficials say that they are now looking into providing an encyclopedia. The computer networks are like TV networks: When one of the networks starts dropping in the ratings, it adds a blockbuster program and wins back its audience.

Subscribing to a computer network requires more commitment than tuning in a TV station, but it can be more rewarding. Part of the excitement comes from knowing that you, as a user, are helping to shape a technology that may someday be as popular as the telephone or the family car. Being a pioneer isn't always easy, but the experience gives you a deeper perspective that can't be earned after a new territory has been tamed. /PC

In Search Of The Source

A short history of The Source confirms Edison's observation that genius is 1 percent inspiration and 99 percent perspiration.

The Source, or Source Telecomputing Corporation (STC), opened its first telephone lines in June 1979. The new service got off to a rocky start, but by fall of 1980 it had attracted almost 6,000 subscribers. At this time, the system consisted of two Prime computers leased from a time-sharing service located in Washington, D.C., across the Potomac from the company's headquarters in McLean, Virginia. The Source's response time was initially very slow, and the continuity of its service was unreliable.

Although The Source offered an impressive array of information services, the company seemed unclear about the direction it should take. Its customers ranged from congressmen to computer hackers, and neither were satisfied. STC's aimlessness wasn't helped by a succession of management teams, each with bigger problems to overcome and bigger promises to keep. Rumors of financial disaster and imminent closure circulated throughout 1980.

In October of that year, *Reader's Digest* purchased The Source and began propping up the fledgling corporation by increasing its staff from 35 to more than 125. The new owner ordered an extensive market survey and brought in impressive tech-

nical expertise. Despite some continued turbulence within the managerial staff, the organization was able to define its goals and begin working toward improving its performance.

The newest management teams agreed that system reliability and quick response time were imperative. Toward these ends they leased time from a second computer service that used a different set of processors. They also added processors to the main system. Despite these efforts, operational problems continued to overshadow every initiative to provide interesting features and friendly software. However, new subscribers kept signing on. By June 1981 their ranks had swollen to 10,000. Most of them sensed that they were participating in an activity with great potential, but persistently slow response time and frequent outages dampened even the most enthusiastic spirits.

At the end of 1981, the management installed by the *Digest* launched a concerted effort to build one of the world's most modern information system installations. It added a series of menus to augment what had been a command-driven display and augmented its services with a user-written special interest section.

These changes, however, generated

new problems. In an attempt to prepare for independent operation, The Source had withdrawn its electronic mail system from the time-sharing service and brought its own software on line in August 1982. The system crashed and wobbled along for over a week, once again testing the loyalty and patience of its nearly 20,000 subscribers. This experience pointed up the need for more careful planning. As a result, the management took The Source off the air on Saturday, September 18, 1982, the first time this had occurred since 1979. Throughout that weekend, the STC staff worked to make the new computer center operational. They achieved a smooth changeover, and users reported an immediate improvement in response time.

The new Source computing center is built around nine Prime 750 computers, each with 3 megabytes of main memory. These are augmented by 19 disk storage machines, resulting in a combination that provides the center with a total of 5.7 billion bytes of storage memory. The center can service 500 users at one time and has the capacity to handle up to 250,000 subscribers without significant changes or expansion. Diesel generators and uninterruptible power contribute to the reliability of the entire system.

The story of The Source illustrates the difficulty of turning an idea into a reality. The Source seems to have finally met the challenge it set for itself. The rest of the dream is up to the users.

—Frank J. Derfler, Jr.

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 - * Date of Accident
 - * Date off Work
 - * Date Returned to Work
 - * Where Accident Happened
 - * How Accident Happened
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 - * Date of Visit
 - * Diagnosis
 - * Treatment
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Comp-U-Store will be available on the Dow Jones News/Retrieval service this year. The shopping service is also available to individual subscribers for a yearly membership fee.

Comp-U-Card of America, Inc., the creator of Comp-U-Store, started a telephone shopping service in 1973. The company added its computer shopping service

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At PC '83 you have the best of all worlds. You can see all the different PC-compatible products in one location at one time. You can talk with factory experts rather than just local salespeople. You can "test drive" each product and decide if it's right for you. And when you find what you're looking for, you can buy it right on the spot.

Best of all, you'll save hundreds—even thousands—of dollars at PC '83. Most of the products shown at PC '83 are sold at special show prices, so you won't have to look hard to find incredible values. And because PC '83 will help you make more informed purchase decisions, you'll end up with products that are better suited to your applications.

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The conference program at PC '83 isn't just a warmed-over, pared-down version of other computer conferences. The seminars, workshops and forums at PC '83 are the result of months of research and planning targeted toward one specific goal: helping you get absolutely the most out of your IBM Personal Computer.

The program features world-renowned PC authorities speaking at over 100 educational sessions. Seminars provide an in-depth, understandable look at a broad range of PC uses in business, home and education. Seminars emphasize "how to," telling you specifically what you need to know—in non-technical language—to use the PC in dozens of different applications.

Forums present an inside look at what's happening in the PC-compatible industry and what new developments you can expect in the next few years.

Software and Hardware Spotlights are a PC '83 exclusive. These workshops address one of the biggest problems that virtually all computer users face: how to decide which software and hardware packages are best for your applications. Each Spotlight provides a detailed discussion and demonstration (with large-screen television) of a group of products, covering their features, capabilities and limitations. Experts are on hand at each of these sessions to answer all your questions.

EASY ON YOUR FEET

We've thought of a lot of details to make your visit to PC '83 just a little more pleasant. As with all of our events, the show is fully carpeted, so your feet won't give out before you've seen all the exhibits.

Our unique Conference and Exhibits Guide helps you quickly find the exhibits and educational sessions you want to attend—even if you can't remember their names. And the Guide is provided free of charge to all attendees.

If you're traveling some distance to attend PC '83, we'll arrange a discounted hotel room near the show site through the PC '83 Housing Bureau. On request, we will also provide information on things to do, places to visit and where to eat in San Francisco and Boston—to make your stay in these grand cities a memorable and relaxing one.

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So if you do anything with the IBM Personal Computer or if you're considering buying one, be sure to put PC '83 in your calendar right away.

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2. All preregistration requests must be received no later than 7 days prior to the event. Telephone or credit card orders cannot be accommodated.

3. For one-day-only registrations, indicate the specific day you will attend the event.

4. Badges and tickets will either be mailed back or held for pick-up at the Show's preregistration desk. In either case the preregistrant will be notified by mail of our receipt of their order. All preregistrants will receive the Schedule of Conferences Program, a list of exhibitors and hotel reservation forms prior to the event.

5. It is recommended that attendees preregister in order to receive the advance information which allows them to preplan and schedule their visit to the Show and Conference. However, badges and tickets can be purchased at the Show.

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CIRCLE 340 ON READER SERVICE CARD

in November 1981.

The first Comp-U-Store users were "techno-junkies," according to Hsueh-Wei Wang, director of consumer electronic functions for Comp-U-Card of America. "They were younger people who loved their computers and had to be the first to do everything with them."

She adds that average Comp-U-Store shoppers are still young—in their 30s—but they use the shopping service because of its convenience and prices, not its novelty. Wang would not reveal how many customers use the service.

Computerized Catalog

Comp-U-Store's product and manufacturer list has 14 product categories, including appliances, cameras, cars, sterling, televisions, watches, pianos, and organs. Each category contains a large variety of choices. Shoppers choosing the Camera option, for example, receive a list of 23 camera manufacturers. They can request style and price information on any number of brands and specific models of

cameras and accessories.

Shoppers who want to browse and compare prices can ask to see all 35mm

MORE THAN
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single-lens reflex cameras. Comp-U-Store then asks shoppers to specify a preferred price range by requesting the low and high prices that they are willing to consider. The service then lists the cameras in that price range. If no preference is selected for price, the service will list the entire stock, one page at a time.

Early in the main menu option, Comp-U-Store asks shoppers to type in the destinations for goods ordered. With this infor-

mation, all prices quoted during the exchange are the service's fully delivered cost (FDC). The FDC includes tax and shipping and handling charges, which vary from state to state. All products come with the manufacturer's warranty. Purchases are delivered by United Parcel Service (UPS) or private trucking firms.

Shopping Procedure

The purchasing procedure for Comp-U-Store is simple and takes little time. First, shoppers choose the Begin Shopping option on the main menu. Another menu then appears on the screen. Among the new options it offers are displays of Comp-U-Store's purchasing terms and conditions and an explanation of the shopping system. First-time shoppers should take the time to read these two sections, while veteran shoppers can skip ahead and place their orders.

After the shopper selects an item, Comp-U-Store asks for order specifications such as color, size, or handling capacity. Comp-U-Store then double-checks

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hour during business hours and \$5 an hour during nonbusiness hours. For individual subscribers, Comp-U-Store charges \$18 an hour during business hours and \$5 an hour during nonbusiness hours. Shoppers should also add the cost of the telephone call itself to the total cost of the purchase.

If subscribers are interested in comparison shopping, the PC's Print Screen function allows them to save some telephone and connect time charges. Shoppers can call up to the screen the various brands of the item they wish to purchase. After printing the screen, users can sign off the network and view the printout of prices at their leisure.

Shoppers should also consider the kind of service they need with the item they are buying. When shopping in a local store, a neophyte photographer is paying for service, advice and, in some cases, training when he purchases his first 35mm camera. These kinds of assistance are not available with computerized shopping. However, a photographer with 5 years' experience might find that shopping at Comp-U-Store is a great way to save money on a new

piece of equipment.

Unlike a mail-order catalog, Comp-U-Store cannot allow shoppers to see what they order. "It is difficult to sell a product

SHOPPERS
should consider the
kind of service they
need for the item they
are buying.

that needs visual appreciation," Wang admits. Buying a video tape machine or a Walkman may be easy for a Comp-U-Store shopper; however, buying a piece of furniture might not be. A shopper who specifies a blue recliner won't know if that shade of blue blends with his or her living room carpet's blue until the armchair is in the room. Another consideration is that merchandise cannot be returned to Comp-

U-Store. The only exception is merchandise damaged in transit.

It is too early to tell what impact electronic shopping will have on retail stores. Firms such as American Can Co., Cox Communications, J.C. Penney, and Sears are conducting electronic shopping tests and studies. Most of these studies involve video shopping, using interactive cable communication systems to order products. Although these tests use video, pictorial representation of items is not yet available. As with Comp-U-Store, a written description must suffice.

Wang admits that Comp-U-Store and future computerized shopping services will not close down the shopping malls or the corner five-and-dimes. She thinks there is room in the marketplace for all. "We complement the retailers," Wang says.

/PC

Katie Seger has worked for the BBC and the Berkeley Gazette. Her articles have appeared in Current, American Film, the Christian Science Monitor, and Redwood Rancher.

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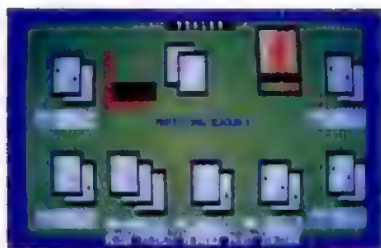
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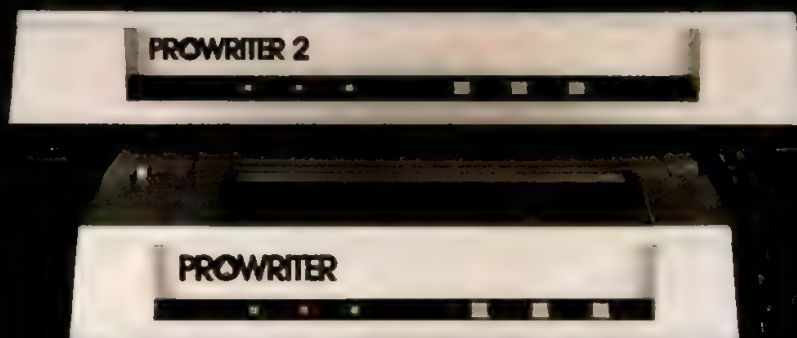
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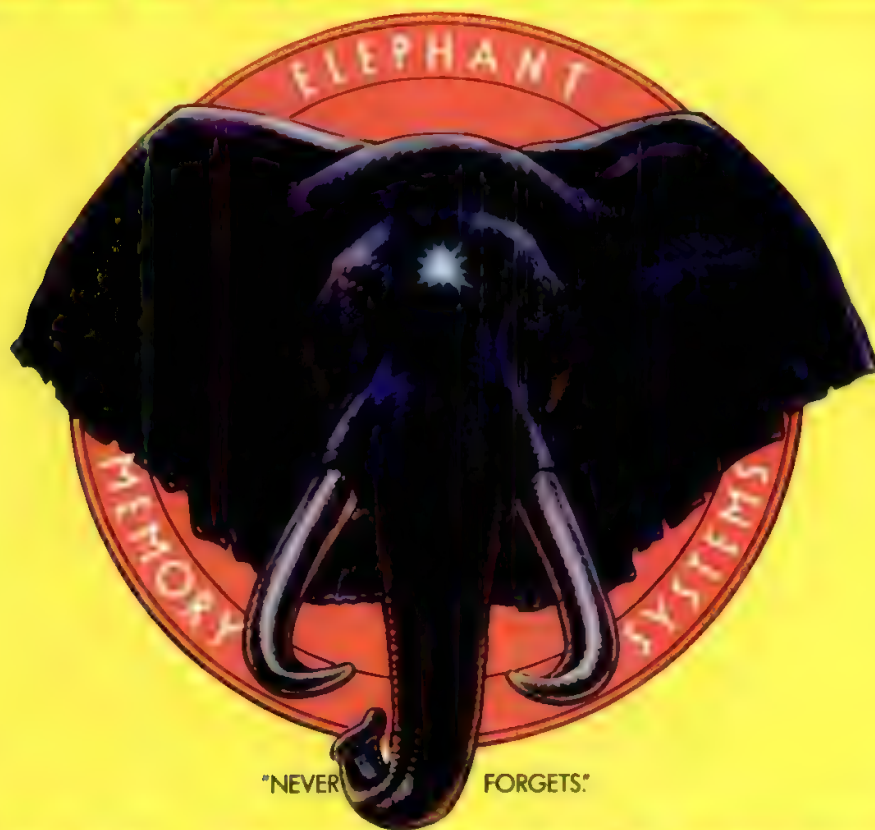


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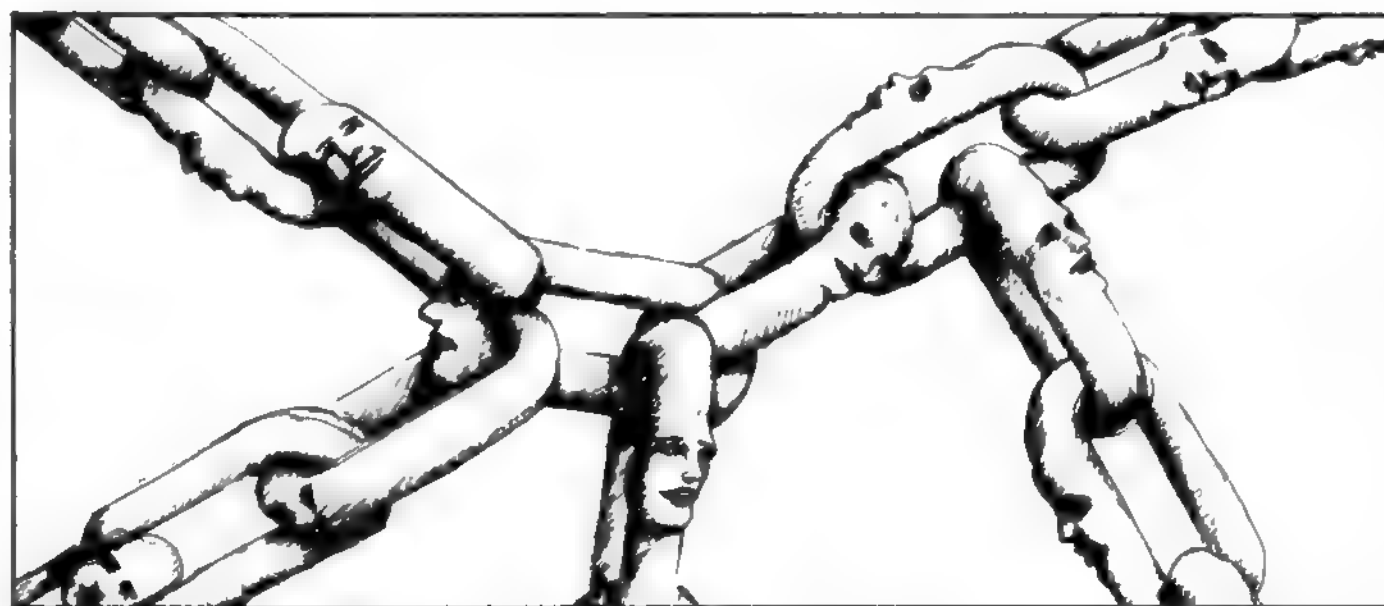
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CIRCLE 393 ON READER SERVICE CARD



Many people in business today have no idea how much information is readily available on data bases.

Information Power To The People



Harvey Acton might be called an information broker. He has established an unusual computer-based venture called Link Service in Arlington Heights, Illinois, a Chicago suburb adjacent to a northwest corridor of unbridled business and residential growth. The link is between business, technical or scientific communities, and information stored on over 600 data bases in the United States. Acton helps define a client's specific information needs and then accesses the data bases in nonprime time, employs his expert research skills to get the information quickly, and supplies the finished product to the client.

Although the service is now aimed at the business and professional market, Link's original goal was to bring information from such data bases as The Source, the Dow Jones News/Retrieval service, and CompuServe to the general, noncomputing public. Information is also available to a home computing public that wants professional information retrieval and personal guidance in obtaining the most from such data bases.

Initial advertising for Link Service produced many curious callers, but few cus-

tomers were interested in an ongoing service. There were pockets of interest for one-shot retrieval jobs of specific information to sate an immediate need. Realizing that a home market might not yet exist for this type of service, and after further researching the market potential, Acton repackaged his offering for the business and technical markets.

Link's Target

As for the philosophy behind Link Service, Acton says, "Fortune 500 companies have a great need for generic and market research for a number of reasons: business planning and forecasting, legal research, and monitoring the activities of other companies in the same business. There is also a demand for today's industry data that normally does not become available until it is published in trade journals a week or two later."

Many companies that should be performing this kind of research, Acton asserts, do not realize that such information is readily available. The biggest companies, of course, have management information services (MIS) departments with

full-time data base researchers on staff. But services such as Link offer the same research power to companies without the volume to keep a full-time researcher busy, or to companies unwilling to commit funds for equipment, training, and staff.

Occasionally, a client wants to take over the research function. In those instances Acton dons his consultant's garb and works with the client to select equipment and communications software. The job also includes installing the equipment and training operators on retrieval techniques for the data bases accessed. In the case of Dialog, an expensive collection of

FORTUNE 500
companies have a
great need for generic
and market research.

professional data bases, Acton arranges for training sessions offered by the information bank's regional offices.

Untapped Potential

To help companies recognize the potential of information retrieval, Acton has prepared a list of sample requests that can be answered by available data bases. Following are some sample requests.

"I need a report on the balance of payments due the United States by Afghanistan for the year ending 1981, with full production and consumption statistics."

"I would like a list of abstracts of arti-

cles written recently on the chemical processing industry, specifically the newest process for polymerization of fatty esters."

"I need a list of all ads that have run in 148 consumer magazines during the past two years that relate to Product X, sorted by company name, brand name, and with a list of ad content."

LINK SERVICE has had some challenging orders, many requiring considerable analysis and report preparation.

Although these exact requests have not come through to Link Service, some rather challenging orders have, including ones requiring considerable analysis and report preparation over and above the basic information retrieval.

A hospital in the Chicago area perceived a demographic change in the surrounding service area, both in terms of potential patients and availability of doctors living in the vicinity. The hospital's request of Link was to provide a dynamic analysis of demographic changes within the area over the next 5 and 10 years. A computer search of census figures past and present saved hours of manual page thumbing and number crunching. From those figures trend lines were computed to assist the hospital in its long-range marketing plan for the community.

Requests for specific lists of sales prospects are common. Acton notes: "Most list requests have unusual twists to them that can't be effectively handled by a traditional mailing list broker. They are easily handled by the data base's sorting capability."

One sales lead client was in search of a carefully culled list of prospects for its expensive computerized business systems. Once a master list was assembled from several data bases, each company's historical return-on-investment factor, among others, was calculated to determine which firms were more likely to have

capital available in the future to comfortably afford a system. No list broker could provide analytical sales leads like that.

Yet another client, oddly enough, was a large company with its own MIS staff. Apparently some top executives wanted information that was too sensitive to entrust to company employees. The confidentiality of the researcher-client relationship would keep the information request secret.

Orders In, Orders Out

Service orders come into Link either verbally over the phone or via Acton's 24-hour public computer bulletin board: (312) 870-7176. A PC user, for example, with communications software and a 300-baud telephone modem could dial the bulletin board and type in a message by following the numerous on-screen prompts (as in electronic mail) for the SYSOP, or System Operator (Acton).

Return of information to clients can be handled five ways, depending on the client's needs and equipment: verbally over the phone; with printouts sent to the client via mail from Link, or more economically, directly from the data base (print charges for records are usually much less than the connect time to download the data); with information left as a message on the bulletin board for the client to access any time, guarded by a security code; with a direct data dump to the client's computer, if properly equipped; or with a floppy disk containing the downloaded data for clients to read on their own computers. The most frequently requested are printouts from the data base, bulletin board messages, and floppy disks. Some communications software, such as Freeware's PC-Talk, can store information coming in from the bulletin board on a PC disk. The user can later refer to the text on the screen (via the Type command in DOS) or print it out (via the Type command plus Ctrl PrtSc).

The average cost of a search is difficult to come up with since the complexity of each job can vary. As an example, however, Acton discussed charges for a simple sales lead retrieval and sort.

Once the contact is established and the parameters of the search have been set, Acton performs a cursory search through the appropriate data bases for a "hit count" (how many names will come from

the sort). The charge for this service is \$40. If the client wishes to go ahead with the project, the \$40 is credited toward the final research tab. Costs for connect time vary greatly with the data base, with quite a few in the range of \$100 per hour. This is where the data base researcher's skill is important. "Once the search is defined, the rest takes only 10 to 15 minutes," Acton says. Connect-time costs are passed on directly to the client without markup, and the researcher's time is billed at \$35 to \$40 per hour for simple research.

Acton admits, however, that a significant number of inquiries are not turned into orders. "It's not cheap to go into data base retrieval, particularly for sales leads" he says. "Very few people at the small-business or entrepreneurial level are willing to put out \$100 or more for a mailing list, even though it's targeted and focused—exactly the list they need."

The subject of data base access cost is a sore one with Acton, especially when he sees the way potential clients respond to connect-time charges, which can be as high as \$300 per hour on some data bases. "There are some greedy people," he contends. "The costs of creating a data base are not small; there's no question about it. But once a data base is produced, no cost is involved besides that of an update. I feel that some unusually large profits are being

***R*ETURN OF information to clients can be handled five ways, depending on the client's needs and equipment.**

made in the data base industry today." Looking at the rates data bases charge, Acton says, "they're probably not being farsighted beyond Fortune 500 companies that can afford their information."

Acton summarizes his biggest challenge: "If there's anything restricting the growth of the information retrieval marketplace, it is the cost." He was very surprised at The Source's connect-time rate increases.

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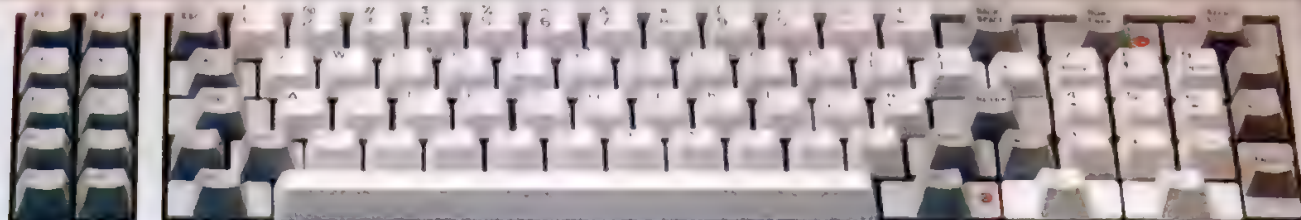
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Software Breakthrough...

NEW QUIKPRO + PLUS WRITES PROGRAMS FOR YOU IN MINUTES ON YOUR Micro

Technical Review
by Wayne Hepburn

QUIKPRO + PLUS is a new breakthrough in software for microcomputers from ICR-FutureSoft.

Until now, whenever you wanted a new separate program in BASIC (Microsoft Basic/MBasic/Basic 80/Oasis Basic), you had to spend a lot of dollars for it, or a lot of hours creating it (if you have the know-how). That's all in the past now.

Anybody who can turn on a computer can write a program, quickly, with this new **Quikpro + Plus** software which generates programs for you. **Quikpro + Plus** is the invention of Joseph Tamargo of Florida. His brilliant approach to program writing allows you to tap the real power and speed of your microcomputer, and it is about time this happened.

I interviewed him to find out more about **Quikpro + Plus** and pass this valuable information to you. He told me "The best part of this software is that it gives you a separate custom program every time you use it. The resulting program is produced, error-free, in BASIC (Microsoft Basic/MBasic/Basic 80/Oasis Basic, as appropriate to your system) for you by **Quikpro + Plus**. What's more, you can list your new program, look at it, see what makes it tick, and modify it as you wish."

You can also, customize, enhance, alter, and even copy the programs you create with **Quikpro + Plus**. This is because programs created by **Quikpro + Plus** are structured, easy to follow, and include many REMARKS statements right in the program listing. I don't know of any other software with the flexibility and ease of use I found in **Quikpro + Plus**.

HUNDREDS OF APPLICATIONS...

For Education, Business, Hobby, Home, Science, Personal, etc. a partial list includes programs like these: Financial Forecasting, Expense Planning, Data Access and Retrieval, Modeling, Record Keeping of all kinds, Statistical Data Banks, and much, much more. **Quikpro + Plus** cuts the time it takes to generate a new custom program down to a few minutes. That's true. I saw a

letter from a user who created a separate program in Basic within fifteen minutes after reading the clear, simple, complete Documentation & Operating Manual for **Quikpro + Plus**. The software will generate File Handling and Data Entry Programs in a file format, drawn right on the screen by user. Programs created by **Quikpro + Plus** produce standard ASCII Data Files allowing data to be easily accessed by other programs, other micro's, and even main frames.

HOW IT WORKS...

The operation of **Quikpro + Plus** is simple and easy. On your screen you answer questions which appear in plain English. The answers generate error-free Filing & Data Entry Programs for you...instantly. This completely eliminates the tedious and time consuming development you normally go through to write a program. Since the instructions are right on the screen you don't need any programming skills to operate **Quikpro + Plus**. Quickly, you get a fully independent new program ready to run on your system. After you create the new program you can remove **Quikpro + Plus** and stick it on the shelf until the next time you create a custom program.

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This software is ready to ship immediately

and you can start writing programs the day you get in. In fact, ICR-FutureSoft guarantees your satisfaction or you can return it for a full refund in ten days after delivery. How's that for confidence? Mr. Tamargo said "There isn't any risk to us...our product works like it's supposed to work and users are very well satisfied. We are glad to guarantee satisfaction."

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A Cottage Industry

For now, Link Service is a part-time activity for Acton, one of the many hats he wears as a data processing and business consultant. He is also sales representative for a microcomputer software company. The nerve center for Link is a separate office in his home. Link's 24-hour bulletin

INFORMATION
retrieval is an ideal
cottage industry
because the work
is done during
the evening.

board is operated by an Apple II. An Apple III shares a green monitor and is used for telecommunications and data handling (a rather large data communications software library for his Apples sits nearby). A Commodore CBM8032 is by now replaced with an IBM PC to handle the business end of his activities.

Information retrieval is an ideal cottage industry, Acton believes, because the heavy research work is done on computer during the less costly, evening hours. It's a business that Acton recommends be started as a part-time affair unless enough funds are available to support all concerned for 2 years or more. "A firm in the Washington, D.C. area that gets a lot of business from lobbyists took 3 years to break even," Acton notes.

At the moment, Acton estimates that Link Service takes up 15 percent of his professional time. "But as activity increases, I'm prepared to adjust the balance accordingly." He advertises little and gets many word-of-mouth referrals from satisfied clients. "Gradually more business is coming to me," he says. But perhaps the biggest attraction for Acton is summed up when he states proudly, "It's fascinating. I love it."

/PC

For further information contact Link Service, Executive Service Corp., 324 Braeside Dr., Arlington Heights, IL 60004, (312) 870-1999.

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The Electronic Bulletin Board

Remember when getting the word out was as simple as posting a notice on the bulletin board in the high school cafeteria? Today, the PC allows you to access and use hundreds of electronic bulletin board systems via the telephone and a modem. Medical bulletin boards, public domain software exchange bulletin boards, FORTH interest group bulletin boards, game bulletin boards, and sexually oriented bulletin boards are among the public information and exchange services that are only a telephone call away.

Bulletin Board Origins

Retail computer stores and software developers maintain some bulletin boards to advertise products, special offers, and sales. The majority of bulletin boards, however, are run by rather altruistic individuals who derive great satisfaction from computerized communication. These individuals simply install an additional telephone line and keep their computer in op-

eration for the use of anyone who dials their bulletin board telephone number.

Bulletin boards have been springing up

BULLETIN
boards have been
springing up across
the United States and
Canada since
February 1978.

across the United States and Canada since February 1978 when the first system, the Computerized Bulletin Board System (CBBS/Chicago, 312/545-8086) went on line. The brainchild of Ward Christensen and Randy Suess, CBBS/Chicago was conceived as a way of exchanging infor-

mation and software among members of their club, the Chicago Area Computer Hobbyists Exchange (CACHE).

According to Suess, "The system was popular from its first day of operation." Some articles in Chicago area newspapers publicized the system to personal computer owners who were not club members and CBBS/Chicago started getting telephone calls from across the country. "There was very little information about what was going on with microcomputers at that time. The system helped fill the vacuum," Suess said. CBBS/Chicago is still very popular; the system handles 50 to 60 calls each day.

Bulletin Board Use

Microcomputer owners now have access to more than 800 bulletin boards. Some bulletin boards operate 24 hours a day, while others are on-line for only certain time periods.

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the PC must use a communications software program and be equipped with a modem set at the correct baud rate (usually 300 baud). Also, the user needs the correct phone number. Several bulletin board telephone numbers are listed in this article. Many bulletin boards contain telephone listings of other systems, so once users are hooked up to one bulletin board, they can easily assemble a listing of telephone numbers for other systems.

Users should not be discouraged if they encounter a busy signal the first time they dial a bulletin board. "Bulletin boards are addictive" according to one system designer, and many users call every day to read their messages and to see the latest news on the system. Users whose software features an auto-redial function should put it to use. If not, they could try phoning during off hours—early morning before 8 a.m. or between 5 and 6 p.m. Users should consider time zones across the United States and Canada when they telephone. A 7 a.m. call from California reaches a New York bulletin board at 10 a.m. EST.

Blues News

The People's Message System-Santee (PMS-Santee, (619) 561-7277) is an outstanding example of a bulletin board. Designed by Bill Blue, a self-employed software designer, this 24-hour service has

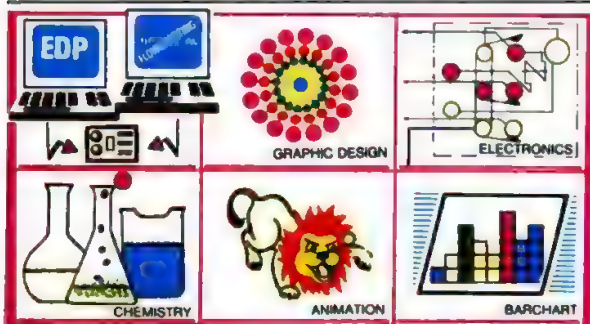
BULLETIN boards are as varied as the people who use them.

been on line since the summer of 1979. "My main goal is to promote communications," Blue said. A hook up with PMS-Santee makes for very interesting reading. Among the information recently found on the system was a notice of a computer club meeting, an open-ended debate about the morality of pirating software for private use, a listing of computer related

articles from a variety of newspapers and publications, and dozens of both private and public messages.

The PMS-Santee, like most bulletin boards, is user friendly. After making the phone connection, PMS-Santee asks callers for their name, city, state, and telephone number. Users are then asked to type "N" for system news or "?" for a list of system commands. The "N" function was designed to help first-time users; it highlights features of the system. Figure 1 shows the PMS-Santee system commands.

The PMS instructions for each command function are clear and easy to follow, but if there is trouble the "Help" command can be activated at any stage of the operation for further clarification. The "expert" function (which many bulletin boards contain) allows users to skip over explanations and shorten the telephone hookup time (and hence, reduce telephone charges). First-time users can save the list of commands and explanations on disk and print out a listing after they sign off the system. The next time they use the



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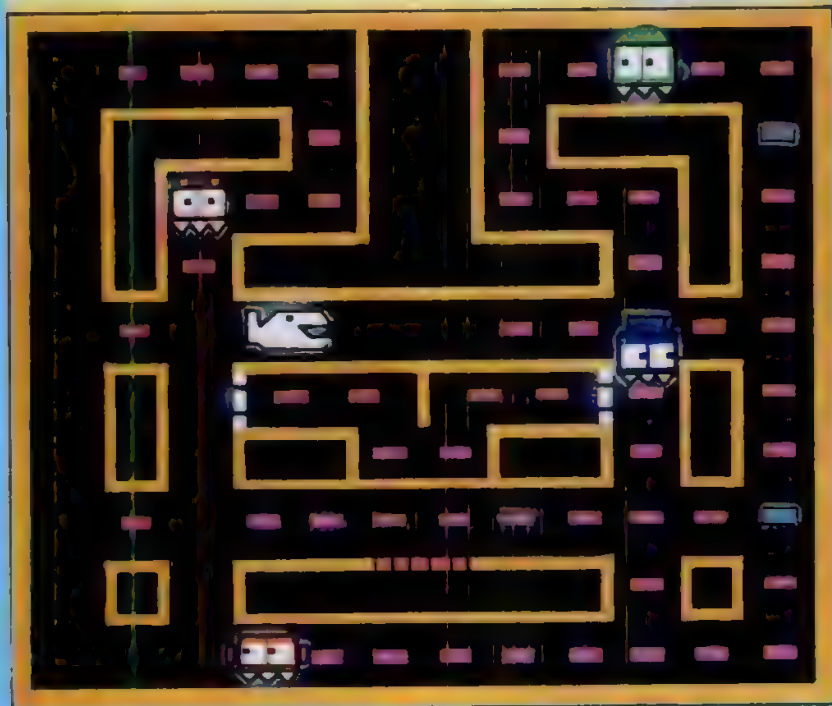
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2108	x	x	
2119		x	
2210		x	
2220			x
2440		x	
2441	x	x	
3468		x	x
3903		x	
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4625		x	x
4626		x	x
4684	x	x	x
4797		x	x
4835		x	x
4952			x
4972		x	
5695	x	x	
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6252		x	x
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bulletin board, they can use the "expert" function and refer to their printout of commands.

"The emphasis is on an exchange of information," Blue said. Articles, messages, and phone numbers of new bulletin board systems are added almost daily. But Blue stressed that he does not run the system by himself; the users are an integral part of PMS-Santee. "Everyone shares the burden. A lot of people are involved in keeping the system accurate."

Most of the For Sale/Wanted listings among the messages on the PMS-Santee feature computer software and hardware items, but occasionally something unusual shows up. "Recently someone advertised that he was looking for a particular type of English saddle," Blue noted. "Sometimes by advertising for an obscure thing like that, you find a friend across the country that you never would have found without the computer. The bulletin board has put me in touch with so many people across the United States that it has paid for itself many times over," he said. Two people who later became Blue's business associ-

Figure 1: PMS-Santee system commands

E	Enter a message into system.	T	Time, date and connect time.
F	Features, articles, excerpts.	U	User modifiable system functions.
G	Goodbye. Leave system. (hang up)	X	EXpert user mode. (on/off toggle)
H	Help with various functions	Z	Continue message entry after abort
I	Information about system	?	Prints list of commands.
F	Kill a message from the files	•	Flagged message memory retrieval.
M	Message alert. Messages for you/	ALT	Switch msg files. (toggle)
N	News-System news	TEST	Modem continuous test loop.
O	Other systems current summary.	ASCII	Pntr frmtd ascii char chart.
Q	Quickscan of message headers.	USERS	File of system users/interests
R	Retrieve a message from the files.	CALI981	1981 calendar/printer format.
S	Scan of message headers.	NEWCALL	Information for new callers.
SR	Selective message retrieval.	GENERAL14	Download programs.
		GENERAL15	Upload programs/files.

ates were first contacted through the bulletin board.

Software Exchanges

Although Blue views the PMS-Santee as an electronic message system, users spend about 20 percent of their access time uploading or downloading public domain software. Other bulletin boards are totally devoted to the exchange of free software. These bulletin boards are also user friend-

ly. Figure 2 contains a listing of some IBM PC bulletin boards that exchange software.

PC owners who have a Baby Blue card may want to telephone some of the RCP/M exchange bulletin boards for other software programs. Two such bulletin boards are: RCP/M Garden Grove, California (714) 534-1547 and the RCP/M Royal Oak, Michigan (313) 759-6569. The Michigan number is a "ring-back" system. Users

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must redial the phone number, let the phone ring once, hang up and redial the number within 40 seconds.

Special Interest Bulletin Boards

Bulletin boards devoted to certain professions or subject areas have also come on-line. Doctors discuss new surgery techniques and drug treatments, astronomy buffs share information on telescopes, and fantasy seekers play Dungeon and Dragons; all communicate via bulletin boards.

Some bulletin boards are almost totally devoted to a special interest group. These

include the Aviators Bulletin Board (916) 393-4459 and the PMS-IF (714) 772-8868, a bulletin board for video enthusiasts. Other bulletin boards serve many different users and only a portion of their setup is reserved for a specialized group. Bill Blue suggests looking in the classified advertisements of specialized publications, such as the New England Journal of Medicine, for telephone numbers of bulletin boards devoted to a particular subject.

Sexually oriented bulletin boards also exist. These bulletin boards, which mirror the classified advertisements of the under-

ground press, warn users of the content of their listings when they first connect with the system, and offer them the chance to exit the system before any "objectionable" language appears on the screen.

Figure 2: IBM PC bulletin boards that exchange software.

- (703) 560-0979
Annandale, VA
(24 hrs., download, messages, bulletins)
- (301) 949-8848
Rockville, MD
(24 hrs., password: talk, password for download/upload only: IBMPC)
- (404) 252-9438
Atlanta, GA
(24 hrs., messages, download/upload, tips, news)
- (303) 773-2699
Denver, CO
(24 hrs., Email, tips, buy, download/upload)
- (703) 978-9592
Fairfax, VA
(24 hrs., tips, download/upload, password: IBMPC)
- (703) 560-7803
Vienna, VA
(24 hrs., messages, download/upload)
- Other IBM PC bulletin boards now on line*
- (301) 948-8877
Gaithersburg, MD
(24 hrs., want, for sale, messages)
- (301) 251-6293
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(24 hrs., communications info., password: IBMPC)
- (301) 937-4339
Beltville, MD
(24 hrs., games, messages)
- (312) 991-8887
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Bulletin boards are as varied as the people who use them. Their potential as a communication tool is tremendous. It is unlikely that they will replace the United States Postal Service; rather, they will augment the mail as individuals and businesses discover them in the future. As one user predicted, "10 years from now people will probably check their bulletin boards as often as they check their mailboxes." /PC

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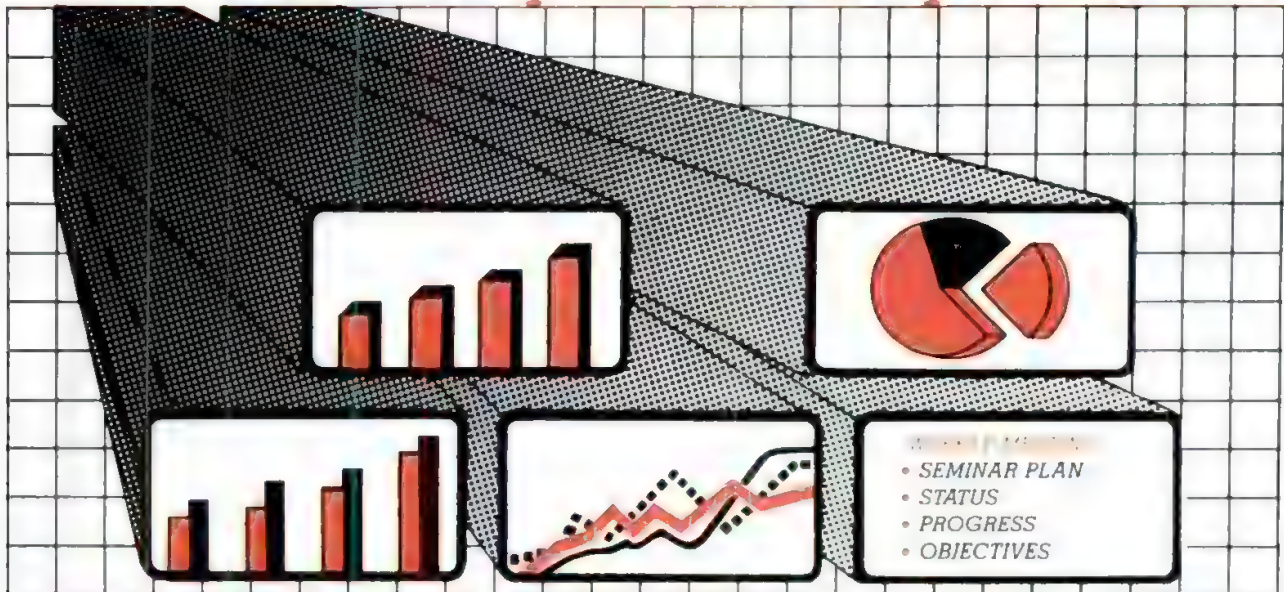
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Why do you need a modem? A computer emits electrical impulses at such low voltage and current that they can't travel

far without a boost. To survive, these signals must be converted to a form that can travel in the world outside the computer. The most common of the several devices that convert these signals is called a modulator/demodulator, or modem.

Some modems convert the computer's signals to and from radio waves. Others change them into light signals for trans-

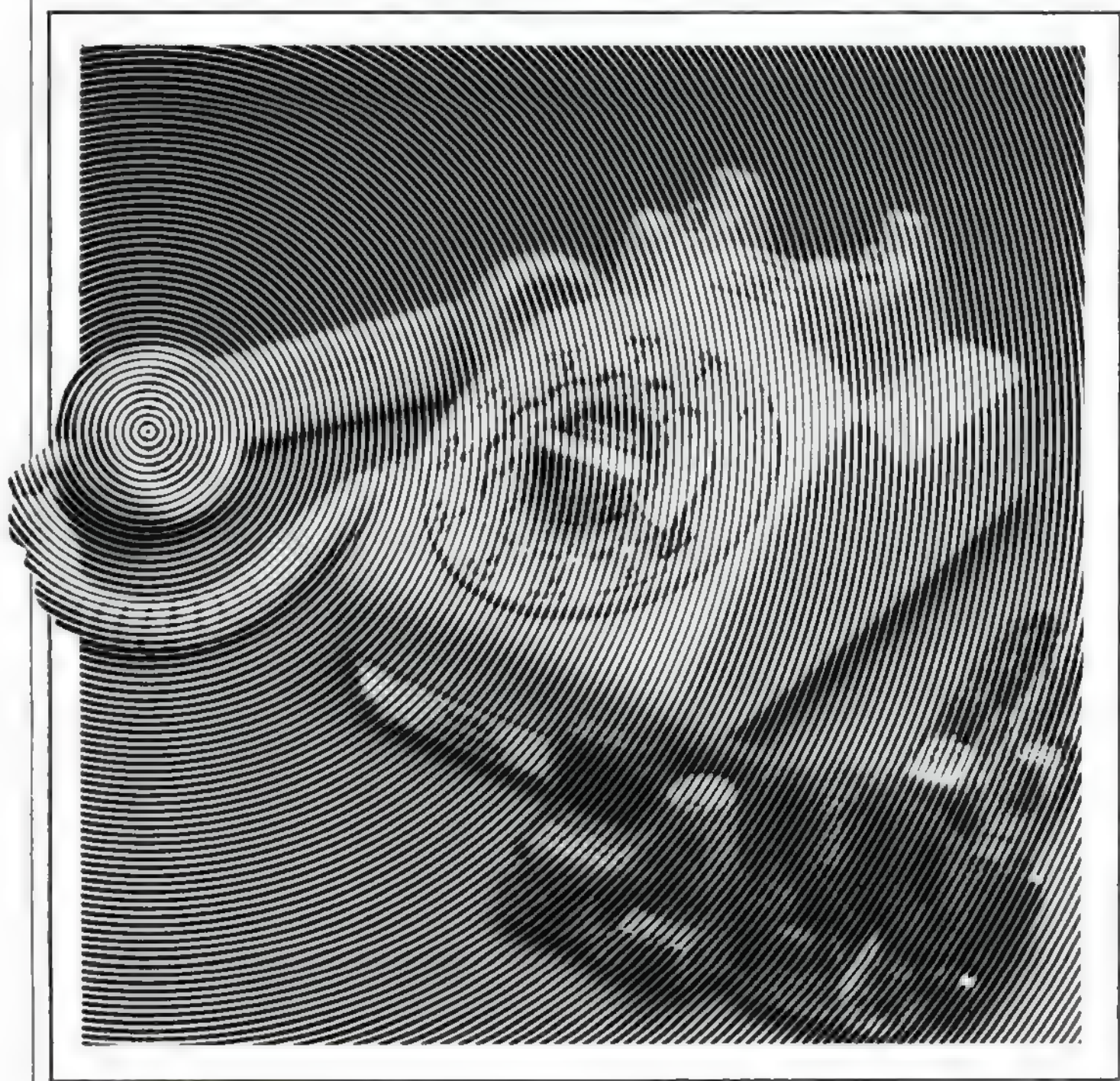
mission over fiber-optic pipes or through the air. The most popular type of modem translates the low-power signals from the computer into audio tones (or electrical signals representing audio tones) that travel over telephone lines.

Let's say you want to use your IBM PC to communicate over a telephone line with another computer. Each computer must have a modem. The signals from one computer are modulated onto the telephone line by the modem at one end and demodulated by the modem at the other end. Some modems must take turns transmitting (half duplex), while others can transmit and receive at the same time (full duplex).

Because phone lines are designed to carry impulses created by the human voice, they are not ideal carriers for computer data. Computers can relay data much more quickly over special data transmission lines. More expensive modems can increase speed and performance, but you'll have to decide for yourself what trade-offs you're willing to make between cost and efficiency.

Speed

When you start looking for a modem, you'll immediately have to decide at what speed you want to send and receive information. Baud rate is the unit most commonly used in data communications to measure transmission speed. For all practical purposes, baud means about the same as bits per second. Most telephone communications links operate at speeds between 110 and 1200 baud; 300 baud is the most common rate. Higher speeds are



DEMI

used, but higher speeds mean higher prices.

A speed of 110 baud gives you a stream of words moving from one computer to another about twice as fast as the average typist can type. This may sound impressive, but at this rate, transferring large files takes a long time. The required transmission time seems even longer if you are paying for a long-distance phone line.

When text is transmitted at 300 baud, it appears on your screen at a comfortable reading speed. The 300-baud rate roughly equals 30 characters per second, about 300 words per minute. So at 300 baud, it takes about 2 minutes to transfer a single-spaced page of text.

At 1200 baud your screen fills up in a very short time, and the screen scrolls quickly, making it difficult to read without pausing the display one page at a time. This speed is useful for capturing data and for transferring it quickly between systems, but if you are just browsing through some data, the computer has to spend a lot of time waiting for you to catch up.

If you use an information service such as The Source, CompuServe, or Dialog, you'll be concerned about spending as little time on the phone as possible since you pay these services an hourly rate. Before you buy a 1200-baud modem, however, remember that 1200-baud transmission will save phone time in one direction only—from the information service or time-sharing system to your computer. When you enter data manually to communicate with the information service, the full value of the 1200-baud rate is not realized.

Besides picking the most appropriate

baud rate for your needs, you'll have to decide on a signaling scheme. At least five standards are commonly used throughout North America, but for practical purposes, you need to be familiar with only three standards set by the Bell Telephone companies.

The most common standard is the Bell 103. This signaling scheme uses two sets of

two tones—one set for each modem—to signal the presence of a 0 or a 1. Because the sets of tones are carefully spaced apart in frequency, each modem can transmit and receive simultaneously. Bell 103-standard modems can operate at speeds of up to 300 baud.

The station that initiates a call normally uses the original pair of tones. The other



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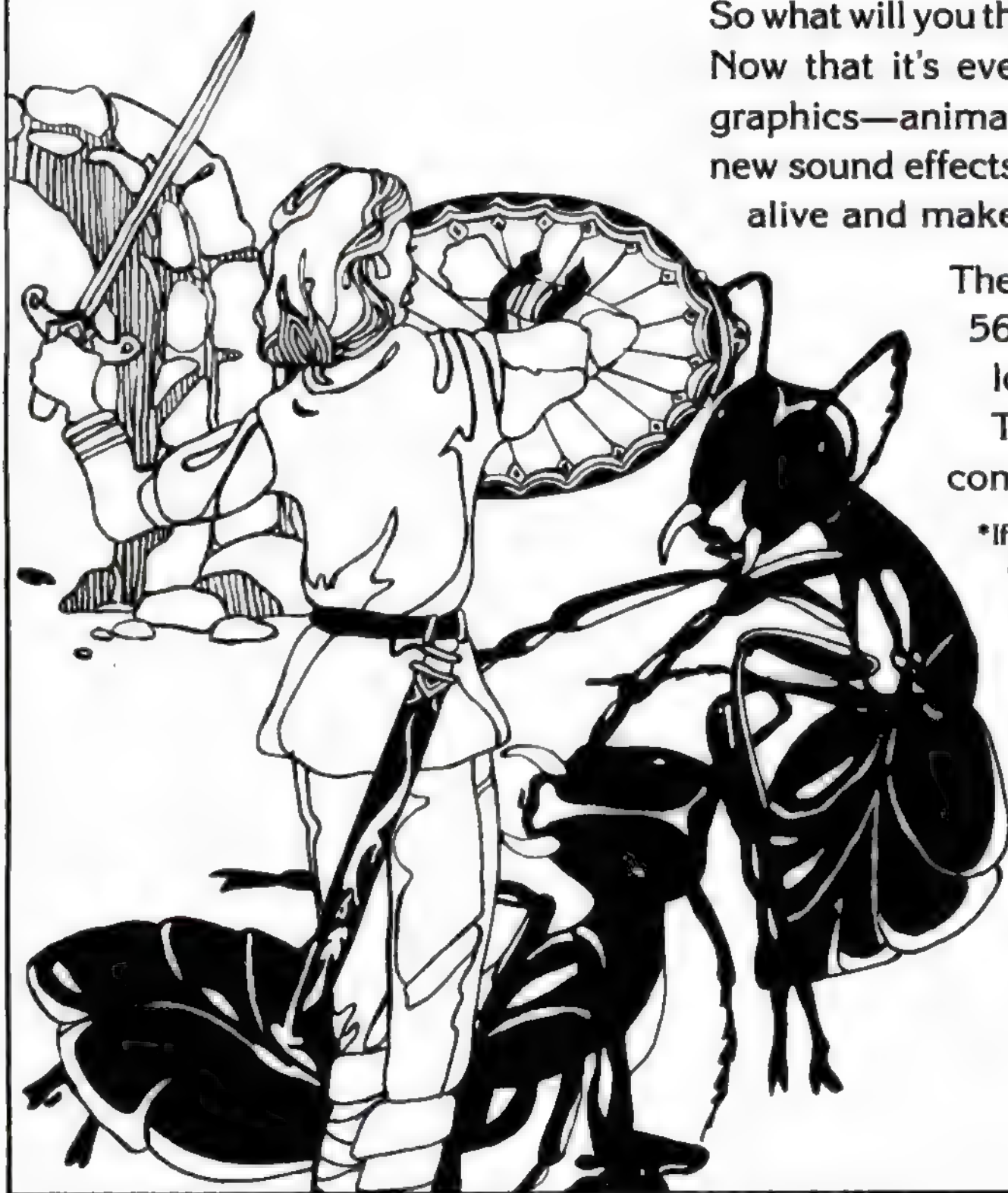
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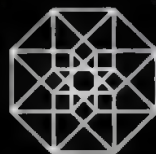
Microfazers are inexpensive universal printer buffers which any computer user cannot afford to be without. Any computer—any printer (or plotter!), whether parallel or serial. Microfazer receives information from the computer at ultra high speeds causing the computer to think the printer is printing just as fast as the computer can send. Microfazer holds the information until your printer can handle it, and then sends it on.

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Creative Computing, Nov. 1982

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station must use the answer tones. Each station fills its portion of the channel when it transmits at 300 baud. Higher speeds call for more channel space. If a transmission rate greater than 300 baud is required, either the transmitting modem must use more than half of the available channel or a different signaling scheme must be used.

Another signaling standard is the Bell 202, which allows transmission of 1200 baud. With the Bell 202, each station takes turns transmitting since the transmitting station uses nearly all of the available channel. The turnaround, or change from transmission to reception, is handled by a special, slow-speed back-channel and some special software.

Bell 202-standard modems cost less than other 1200-baud modems, but they are not widely used for personal communications because of the one-way-at-a-time broadcast limitation. Be wary of inexpensive 1200-baud modems; if they use the Bell 202 standard, their applications are limited.

The most common 1200-baud modem standard, the Bell 212A, allows simultaneous transmission and reception at 1200 baud over regular telephone lines. Bell 212A uses a precise signal modulation that is difficult to produce and to decode. Modems using this standard have expensive, sophisticated audio and digital circuitry.

MODEMS allow phone lines to be used for data communications.

The complete Bell 212A standard describes a modem able to operate at both 300 baud using the Bell 103 standard signaling scheme and at 1200 baud using the Bell 212A scheme.

Trends

Some significant trends are appearing in the modem market. One trend is toward smaller and cheaper Bell 103 modems that are built into computers, terminals, and telephones. Several manufacturers are bringing out Bell 103 modems that use only one or two chips, and sell in wholesale

quantities for as little as \$40 apiece. In the near future we will see cheaper 300-baud modems, Bell 103 modems with more special features, and an increasing number of modems built into equipment along with an RS-232C serial port. A second trend is toward less costly 1200-baud Bell 212A modems that don't have many features.

Finally, several sections of the industry are successfully using a dual-speed modem that accepts data at rapid transmission rates from an information service but moves data to the service at typing speed. This system has the advantage of saving time and money when you use the information service. Though less expensive to buy than typical Bell 212A modems, these devices have not yet become standard-

ized, and acceptance by the industry has been slow.

Connecting Up: The Computer End

There are two sides to the modem connection story: the computer end and the telephone end. Most modems connect to the terminal or computer they are serving through the RS-232C serial port. A few modems can connect directly to the computer's internal data bus, eliminating the need for a serial port.

IN THE NEAR
future we will see
cheaper 300-baud
modems with more
special features, and
more modems built
into equipment.

The standard connector for RS-232C cables is known as the DB-25. Most microcomputers have a female DB-25 on the chassis that connects with a male DB-25 on the connecting cable, but the IBM PC has a male connector on the serial port card. This means you need a connecting cable with a female plug on one end for the PC and a male plug on the other for the modem. If you already own a cable to connect a modem to another computer, it is probably a double male and will not work. Double-female adapters that allow you to connect a male-male cable to the PC are available.

The telecommunications software used in a system can affect the way the modem connects to the computer. Some software authors do not take into consideration all of the lines in the RS-232C signaling scheme. These lines can be used by the modem and computer to exchange information or commands. Some software packages advise you to rewire your modem cable so that certain status signals can be routed where the author wants them. Be careful; unless you are sure the program you have is the only communications program you are ever going to use, or unless you are willing to buy a new cable,

Product Information

*For more information on
the products mentioned in
this article, consult the
following list of
manufacturers.*

The CAT
Novation, Inc.
18664 Oxnard St.
Tarzana, CA 91356
(213) 996-5060

List Price: The CAT \$189; The Auto-
CAT 300 baud \$249, 1200 baud \$695

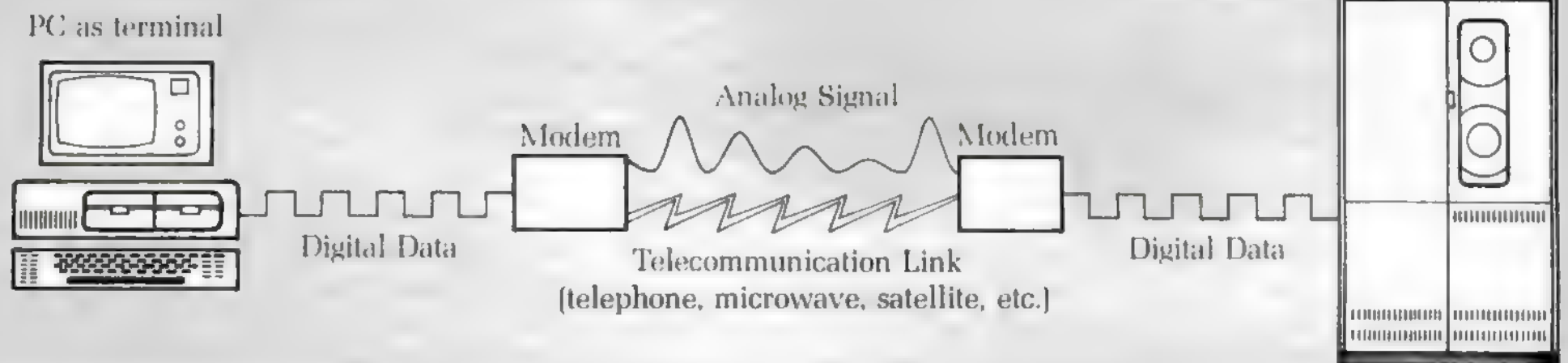
Modemphone
Racal-Vadic, Inc.
222 Caspian Dr.
Sunnyvale, CA 94086
(408) 744-0810

List Price: \$250-\$380 (depending on
options)

Hayes Stack Smartmodem
Hayes Microcomputer Products, Inc.
5835 Peachtree Corners East
Norcross, GA 30092
(404) 449-8791
List Price: 300 baud \$289; 1200 baud
\$699

Universal Data Systems 212LP
Universal Data Systems, Inc.
5000 Bradford Dr.
Huntsville, AL 35805
(205) 837-8100
List Price: \$495

How a Modem Works



Most microcomputer modems (those which meet the Bell 103/113 standards for 300-baud modems) use frequency-modulation. If the digital bit is a 0, the modem transmits a low frequency tone—this appears as the wider waves in the analog signal. If the digital bit is 1, the modem sends a higher frequency tone—the narrower waves in the analog signal.

When the modem receives transmissions, it generates a 1 upon sensing the higher frequency. It generates a 0 when it senses the lower frequency. This technique works for speeds up to 300 baud.

rewiring is probably unwise.

One cable fabricator, The Cable Connection, seems to understand all of the complexities of RS-232C and printer cables for the IBM PC. It also supplies the conversion connectors mentioned earlier and such things as shielded cables. Shielded cables provide more reliable operation for both modems and printers in runs of 12 feet and longer and in areas where signals from electrical equipment or radio transmitters may be present. Contact The Cable Connection at P.O. Box 44124, Gateway Station, Aurora, CO 80044.

Connecting Up: The Telephone End

Modems generally connect to the telephone lines in one of two ways: acoustic coupling or direct connection. An acoustically coupled modem, called an acoustic coupler, uses molded rubber cups to hold the telephone handset over a small microphone and speaker. No electrical connection is made between the modem and the telephone; everything is done by sound. Acoustic couplers work only with standard desk telephones. If you have a modernistic or designer phone, the handset may not fit into the cups. Acoustic couplers are usually limited to 300 baud, and they do not do well in noisy environments where outside sounds can disrupt the connection.

Acoustic couplers were particularly popular several years ago when there were strict limitations on the kinds of equipment that could be electrically connected to telephone lines. These restrictions have been eased, and manufacturers have developed standard circuitry to meet

the remaining FCC registration requirements.

Most modems marketed for use with the IBM PC use direct connection. These devices connect to the telephone lines electrically through small modular telephone plugs. Direct connection avoids the outside noise and size limitations of acoustic couplers, while making such features as automatic dialing and automatic answering practical.

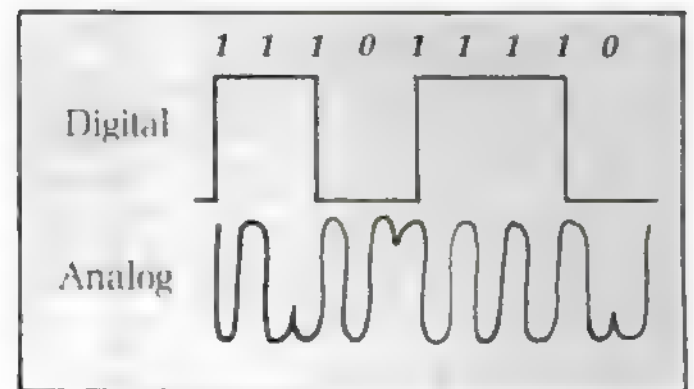
Direct-connection modems require a telephone or telephone line with modular

DIRECT connection makes such features as automatic dialing and automatic answering practical.

plugs. If you don't have these plugs on your telephone system, a retail electronics store can usually supply you with what you need.

Some Popular Modems

The modems on the market that work well with the IBM PC have a number of features and come in a wide range of prices. The first modem to gain wide acceptance among microcomputer users was the Novation CAT. An acoustic coupler,



If data is sent faster than 300 baud, a different kind of modem, one that uses phase-shift keying (PSK) is needed. With PSK, the modem reads the digital data and shifts the phase of the analog signal accordingly. In the above examples, a phase shift occurs when the modem reads 1. When the receiving modem senses a phase shift in the analog signal, it reverses the process and generates a digital 1.

the CAT is sold under the labels of several manufacturers. The CAT gives reliable 300-baud service and is available through many outlets for under \$200. Novation also has a direct-connect version of the CAT, known as the D-CAT, that sells for around \$250. The Novation Auto-CAT is the same as the D-CAT but with an automatic answering feature added. Novation recently announced a Bell 212A-standard, 1200-baud version of the D-CAT with several optional features.

During the past 18 months, a completely different kind of modem has effectively replaced the CAT as the standard of the industry. This is the Smartmodem, manufactured by Hayes Microcomputer Products. Many popular telecommunications software programs for the IBM PC such as PC Talk, PC Modem, and Crosstalk have special functions that integrate with the Smartmodem.

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The Smartmodem is smart because it contains an internal microprocessor that monitors the RS-232C data stream from the computer and looks for special commands addressed to the modem. Its internal program allows the modem to answer a ringing line automatically, to dial the line using pulses or tones, to operate using various combinations of ASCII word length and parity, and to perform various tests. The Hayes Smartmodem retails for just under \$300, but it is often discounted to less than \$250.

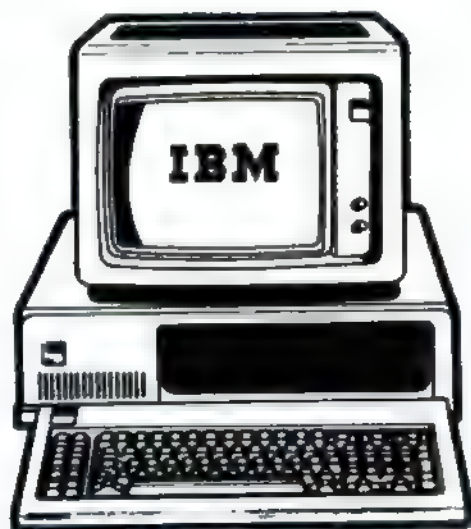
THE
Smartmodem is smart
because it contains an
internal
microprocessor.

The terminal software programs that integrate the IBM PC with the Smartmodem usually include a telephone number list and a table of parameter settings associated with each number. A PC equipped with the right software and a Hayes Smartmodem can automatically answer calls, hang up when the caller is done, and dial calls in response to the PC's clock or the companion Hayes Chronograph.

Hayes Microcomputer products recently released the Hayes Smartmodem 1200, a Bell 212A-standard modem that has all the programming features of the original Smartmodem. This modem provides both 300- and 1200-baud service and sells for under \$700.

If you already own a 300-baud modem but would like 1200-baud service at a modest price, you should investigate the UDS 212LP made by Universal Data Systems. The UDS 212LP is a no-frills modem that operates at 1200 baud using the Bell 212A signaling scheme. It doesn't have the lights or options found on other Bell 212A modems, and it doesn't provide 300-baud service, but it sells for less than \$500 and performs reliably.

UDS makes a complete line of low-cost, no-frills modems as well as a variety of full capability modems that can compete with any on the market. /PC



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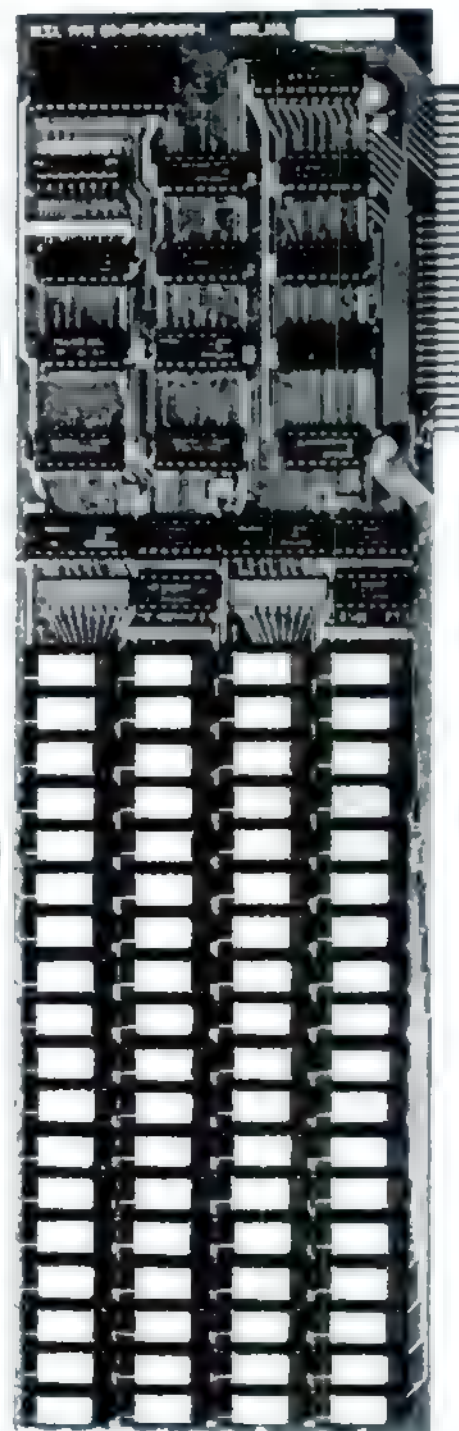
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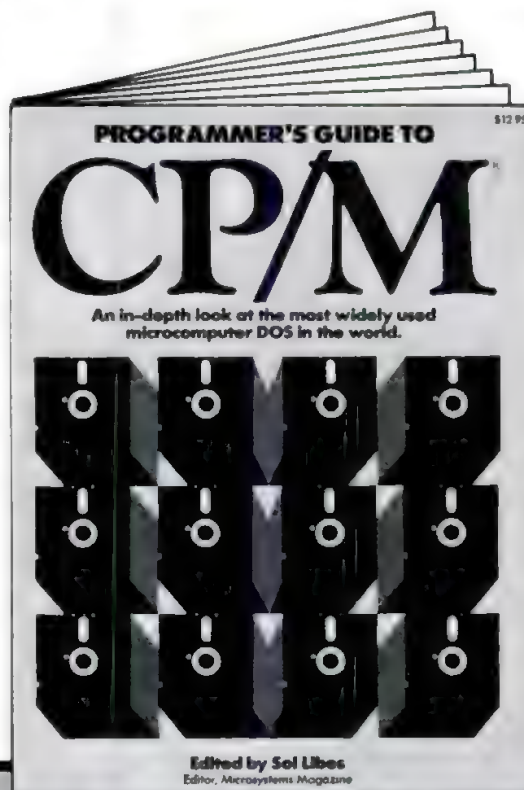
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Modems With Mind

Computers are not the only beneficiaries of the continuing advances in integrated circuit technology. Printers, terminals, disk controllers, and even keyboards are often designed using one or more microprocessors, resulting in simpler design, improved flexibility, and easier maintenance. Communications products have been no exception to this trend.

Early Modems

Early modems for personal computers were generally of two types: those that were located within the computer's own housing (bus-connected) and those that could stand alone. Both types attached to telephone lines via a modular plug at the end of the unit's cord mated with standard telephone outlets.

Bus-connected modems were packaged on a printed circuit card that plugged directly into the input-output bus of the system. This approach took maximum advantage of the logic, power supply, and cabinet of the system (assuming room was provided for another circuit card.) Since the modem was part of a personal computer, functions such as monitoring call progress signals and dialing could be added to the system.

The other major type of modem was designed as a separate package, with its own cabinet and power supply. The con-

A Comparison of Smart Modem Features

This chart compares the features and capabilities of four modems with self-contained microprocessors.



Product Identification

BIZCOMP 1012 Intelligent Modem
Business Computer Corp.
P.O. Box 7498
Menlo Park, CA 94025
(408) 745-1616
List price: \$895

Cermetek 212A Modem
Cermetek
Microelectronics, Inc.
1308 Borregas Ave.
Sunnyvale, CA 94086
(408) 734-8150
List price: \$595

Hayes Smartmodem Model 1200
Hayes Microcomputer Products, Inc.
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Norcross, GA 30092
(404) 449-8791
List price: \$699

Vadic 3451 Auto-Dial Modem
Racal-Vadic, Inc.
222 Caspian Dr.
Sunnyvale, CA 94086
(408) 744-0810
List price: \$975

Of Their Own

Modem speed/compatibility	Dialer Type	Autobaud Speeds	Positive Dial Tone Detect	Interface	Response Modes	Number Memory	Redial Command	Warranty Duration	Special Features
1200 baud; 1200/1103/1103	Pulse, Tone	110, 134.5, 150, 200, 300, 1200 baud	Yes	8 commands 9 responses	Terminal, computer	Last number dialed	Repeats until answer	90 days	TWX answerback, Command-invoked self test, Remote control option
1200 baud; 1200/1103/1103	Pulse	None (manual control)	No (2 second pause)	3 commands 5 responses	Terminal	Last number dialed	Repeats once	1 year	Easy manual control, Numerous jumper options
1200 baud; 1200/1103/1103	Pulse, Tone	110, 300, 1200 baud	No	19 commands 19 responses	Terminal, computer	None	Repeats once ("Repeat Last Command")	2 years	Audio monitor, Comprehensive programmability, Hobbyist-oriented manual
1200 baud; 1200/1103/1103	Pulse	300, 1200 baud	No (5 second pause)	6 commands 5 responses	Terminal	0 numbers (61 total digits)	Repeats up to 9 times	1 year	Wide compatibility, One-switch selection of standard configuration

nection to the computer was made via a standard interface called an RS-232 serial port, a common way to attach other devices such as printers and display terminals. Since the signals of the system's input/output bus did not extend out through the serial port, including automatic dialing and other advanced functions was impractical.

Smart Modems

Adding a microprocessor and a serial port to an outboard modem created new possibilities. All of the fancy functions formerly limited to bus-connected units could now be built in, and any programming language that provided access to a serial port could be used to control it. Through a technique called code multiplexing, the same path could be used to communicate with the modem as well as the remote computer or terminal, but at different times—almost as if the program were talking to a telephone operator.

This smart modem has several advan-

tages over both older kinds of modems. Since the RS-232 serial port is available on most computers, manufacturers have a

ADDITION a microprocessor and a serial port to an outboard modem created new possibilities.

much wider market with a modem than with a bus-connected unit. This has had the effect of lowering the price, due to economies of scale in production. Since system-dependent code is not required to program a smart modem, any programs developed by a manufacturer or user will work on other computers. This made it

easier to develop more sophisticated communications programs at lower cost. For these reasons, the four modems reviewed in the chart are of the intelligent, outboard type.

Product Features

The smart modem chart compares the following features.

- **Modem Speed/Compatibility:** This describes the kinds of modems with which the unit can communicate. All four modems comply with the Bell 103/113 (at 300 baud) and Bell 212A (at 1200 baud) standards; the Vadic unit is compatible with other Vadic 3400-series modems as well.

- **Dialer:** Of the two kinds of telephone dialers—pulse (corresponding to telephones with rotary dials) and tone (for push-button phones), tone signaling is much faster. If tone dialing is offered in your area, units offering the choice are preferable.

- **Autobaud Speeds:** Autobaud is the ability of a device to determine the line

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speed at which a remote computer is sending signals. The modem examines the first few characters received (which are typically carriage returns) after startup or reset. This feature is especially desirable if you use more than one line speed.

- **Positive Dial-Tone Detect:** A smart modem can dial a number in a smart or in a blind way. The smart method is faster and more reliable. A dial tone indicates that the telephone system is ready to accept a number. Normally, it is given shortly after the caller takes the receiver off the hook. Positive dial tone detection allows delivery of the first digits dialed as soon as the telephone system can take it.

Blind dialing relies on a fixed delay between reception of a dial tone and transmission of the first digit. The longer the delay, the safer it is to start dialing—and the longer it takes to place the call. A unit that has both positive dial tone detect and tone dialing provides the most rapid operation. If you use a discount long-distance telephone service such as MCI or

Sprint, this feature is even more valuable, as the delay between the first and second dial tones can vary considerably. Before

SHARING your system between two or more tasks might attract you to a modem with the redial function.

buying a modem, you should test it for compatibility with your discount phone service if you use one.

- **Interface:** This category gives the number of different commands that the unit will accept for computer control and the number of different responses that are

possible. In general, the larger the numbers, the better, but small differences between products are not important.

- **Response Modes:** The smart modem's responses to your program commands can be either chatty (One unit responds to a Ctrl-E with "*HELLO, I'M READY") or terse (a single digit). Chatty responses were designed for human operators at dumb terminals, hence the notation *Terminal*. Terse responses were designed for use with a computer program and are referred to as *Computer*. Some units have both modes, and may be switched from one to the other.

- **Number Memory:** Some modems include memory that can be loaded with telephone numbers. These may later be referred to using a single character. The size of this memory, if available, is listed. Number memory is important primarily with human operators at dumb terminals; a personal computer really doesn't need it.

- **Redial Command:** A variation on the number memory idea is the ability to

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repeat a call attempt automatically until the remote modem (which may be busy) answers. A very sophisticated program can use this feature, but simpler ones simply repeat the call procedure until either successful or terminated by the operator.

- **Warranty Duration:** This category lists the duration of the manufacturer's warranty.

- **Special Features:** These are characteristics that tend to stand out between units.

Making a Choice

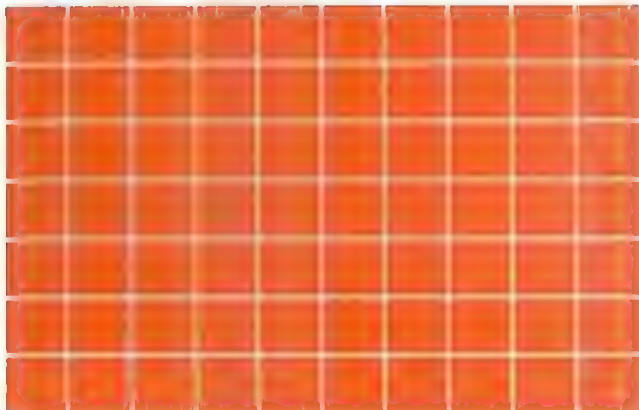
If you use a smart modem with a dumb terminal as well as with the PC, autobaud, terminal response mode, number memory, and redial are important features to consider. If you need to make many calls in a short time, tone dialing and positive dial tone detection speed the process. If you need to communicate with the widest variety of 1200 baud modems, select a unit compatible with both major standards for that speed. Sharing your system between two or more tasks (of which communicating is only one) might attract you to a modem with the redial function.

Many PC users tend to be fascinated by ideas such as unattended operation, elec-

FORTHCOMING
developments in
communications
hardware for the PC
should make the next
few years interesting,
indeed.

tronic mail, and data communications. Even if you aren't ready to buy a smart modem, thinking about what could be done with one and how to program it could help you prepare for future applications. Forthcoming developments in communications hardware for the PC should make the next few years interesting, indeed. /PC

Jack Powers is a communications systems programmer at a large computing installation in the San Francisco Bay area.



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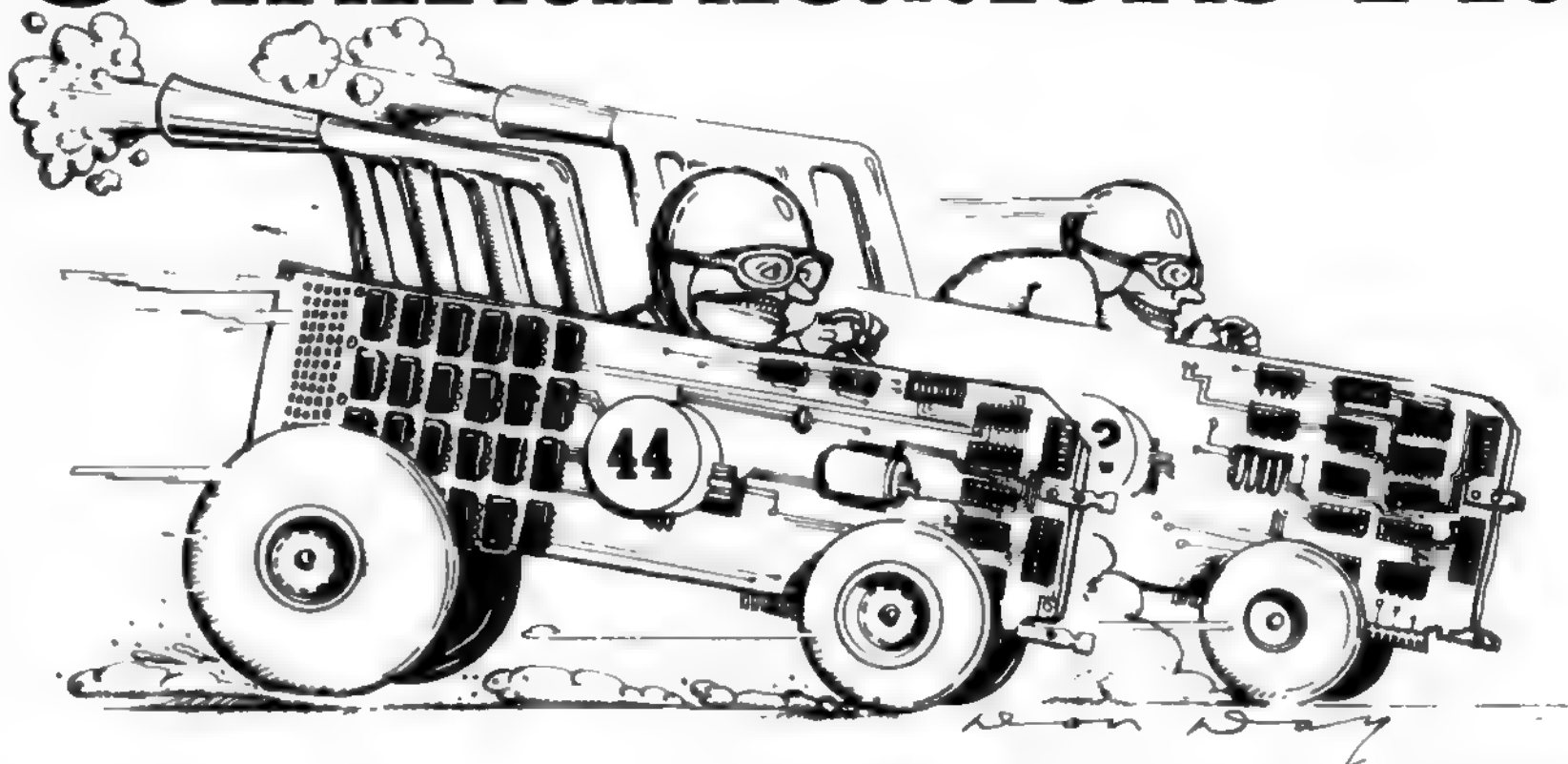
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Telecommunicating with the PC requires several items: a modem and some cables, a communications software program, and a serial communications port. Perhaps the least understood of these elements is the

serial communications port. Making the right selection among the wide variety of serial port options available for the PC is vital—an improper choice could cost the user both money and expansion slot space.

Data moves in and out of the computer through the serial port. It is often called the RS-232C serial port in reference to the electrical signaling scheme typically used to transmit the data. Besides telecommunications, the RS-232C serial port can be used to connect the PC with other computers, printers, plotters, and communications modems.

IBM offers an RS-232C serial port with a printed circuit card called the Asynchronous Communications Adapter. This card costs about \$150 and uses one expansion slot. Unlike the other products discussed in this article, IBM's adapter card provides only one function: communications.

Soon after IBM introduced the PC, other companies saw the need to combine more than one function with the serial port to save expansion space. Several products that are now available give PCs the ability to communicate, increase memory, keep track of the time and day, and feed a parallel printer with a single adapter card. Three adapter cards, or combo cards, that combine serial communica-

tions with other functions are reviewed in this article.

All of these cards are simple to install. An inexperienced person working slowly and making frequent reference to the instructions could install the cards in 20 minutes. Such a procedure usually consists of removing two screws from the back of the PC cabinet, sliding the cabinet forward and off, setting a few switches, and removing a blank cover from the back wall of the cabinet. The card is then inserted into the slot and screwed down.

Using these particular cards is not the only way to combine a serial port with other functions, but it is a typical option available from major suppliers.

Apparat Combo Card

Apparat, of Denver, Colorado, was one of the first established computer peripheral companies to customize and upgrade PCs from the bare bones configuration by offering such options as dual-headed drives.

Apparat's multifunction card is called, appropriately enough, the Combo Card. It combines a calendar clock, a parallel printer interface, and an asynchronous RS-232C serial port. This card does not include RAM.

The Combo Card extends the entire 13-inch length of an expansion slot. When installing the Combo Card (or any 13-inch card) in the last outboard slot in the PC (next to the speaker), the user must take extra care to avoid contact between the back of the board and the frame of the speaker.

Except for the unique clock chip, all the integrated circuits on the Apparat board include sockets. Sockets are usually a positive sign in evaluation of hardware; they facilitate troubleshooting and repair. Manufacturers must choose sockets carefully because some have been known to allow the integrated circuits to creep out, particularly during shipment.

The Apparat board has both an RS-232C serial port and a DB-25 parallel printer port. Since the PC's back panel does not provide enough room for two

full-size connectors, Apparat had to reduce the size of one port. The company chose to make the RS-232C serial port smaller while keeping the DB-25 parallel printer port the standard size of the printer connector used by IBM. But Apparat supplies a short cable to mate its special connector with a standard RS-232C serial cable. This cable can be attached easily and adds a few extra feet of cable to a serial device.

Apparat's serial port uses the same INS 8250 universal asynchronous receiver transmitter (UART) chip as IBM's serial card and is compatible with all IBM PC software. Jumpers on the board determine whether the UART will be addressed as communications port 1 or 2. This option allows the PC to have two active RS-232C ports. With its two ports, Apparat's configuration permits the PC to communicate

with a modem and a serial printer simultaneously.

The printer interface on the Combo Card is functionally the same as the printer interface card from IBM. The user can assign it to either of two separate addresses by changing jumpers on the card. The jumpers used to set the port address are slide connectors that provide positive contact and easy modification.

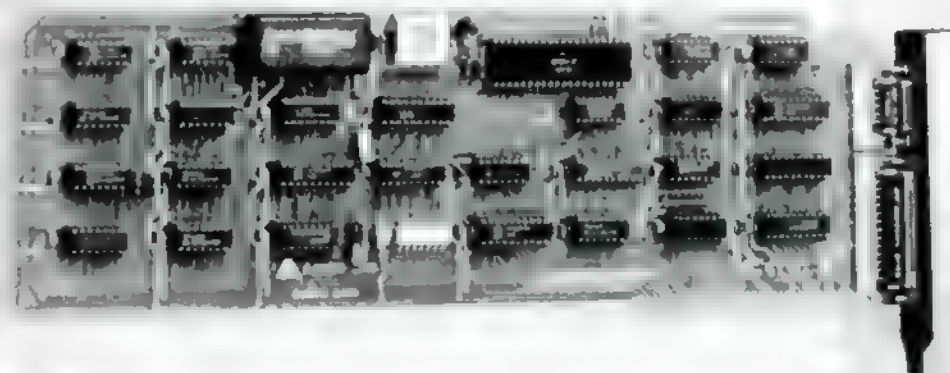
Some specialized peripheral devices such as digitizers and analog/digital converters may require a two-way parallel port to communicate with the computer. The Apparat Combo Card can be modified for use as a two-way device. Some special but relatively simple software is needed to shift the information out of the parallel input port.

A crystal oscillator controls the calendar clock, which is on a single integrated circuit chip. The frequency of the oscillator can be varied, but the clock is quite accurate and requires no adjustment. A built-in rechargeable battery will keep the clock running for 3 months if the board is removed or the computer is not turned on.

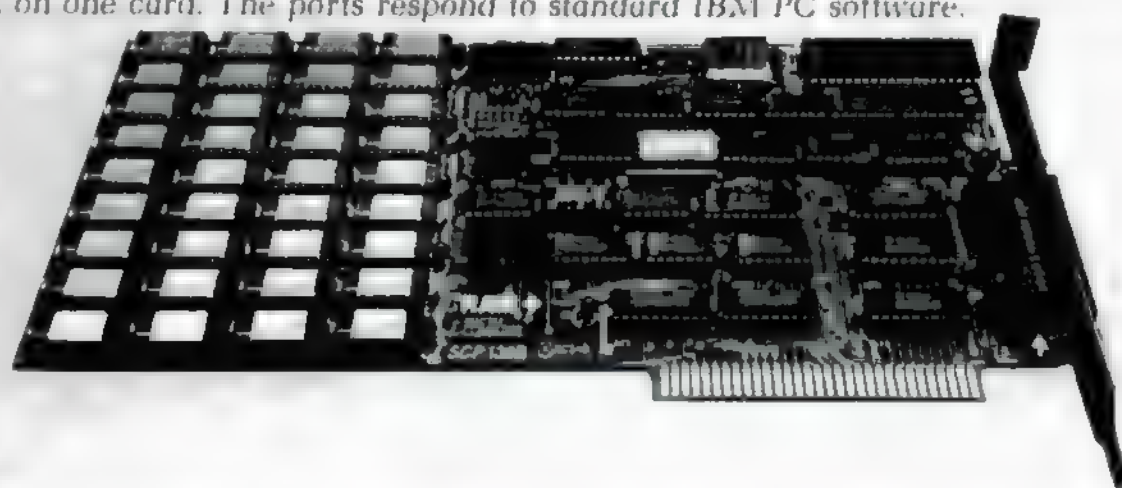
Apparat provides two ways to integrate the clock with the operating system—a disk containing both a patch to the operating system and a simple program that can be made part of a Batch command file. The PC-DOS patch works with only DOS version 1.0, so most people will use the program as part of a .BAT file. The time/date prompt that normally appears at sign-on is eliminated, but the user can obtain the information by employing the TIMES/DATE\$ functions in BASIC or by reading port 2A3 hex in any other manner.

The Combo Card's documentation consists of nine pages of text divided equally between installation instructions and technical descriptions. No illustrations are provided, but none are needed because the written material is presented simply and clearly. Anyone who can use a screwdriver and enter a few DOS commands should be able to install and use the Combo Card.

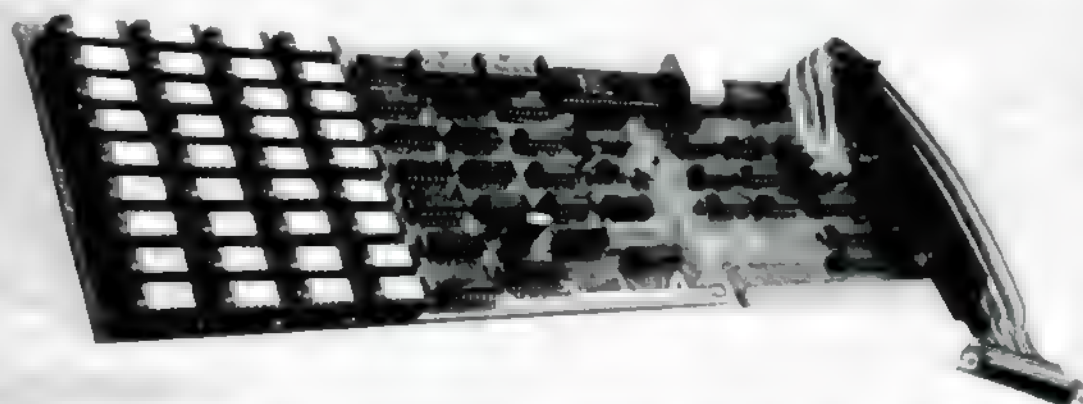
The Combo Card can be useful in a number of PC configurations. Users who have an IBM color/graphics board, for example, may not have a parallel printer port, which is a part of the monochrome display board. If the user has sufficient memory from a separate RAM card but still wants both a serial and a parallel port,



The Combo Card from Apparat combines an RS-232C serial port, a parallel printer port, and a clock on one card. The ports respond to standard IBM PC software.



The RAM+ from Seattle Computer combines a serial port with up to 256K of RAM. A special program called Flash Disk allows a large segment of the system memory to be treated as a very fast disk drive.

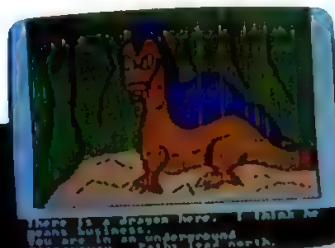


The Quadboard combines RAM, a serial port, a parallel printer port, and a clock. Quad-Drive allows full system capability and flexible user selection of memory allocation to RAM disk operation.

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CIRCLE 400 ON READER SERVICE CARD

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the Apparat Combo Card is an excellent choice. It provides both ports at a lower price than IBM's, saves an expansion slot, and the clock is essentially thrown in for free. Many other users whose PCs have similar configurations will find the Apparat Combo Card a useful and economical way to add communications capabilities.

Seattle Computer RAM+

Some users may need communications and more memory but may either already have or simply don't want a parallel printer port. Seattle Computer in Seattle, Washington, produces a RAM+ memory card that combines up to 256K of RAM with a serial port. The company also manufactures and markets its own highly rated 8086-based machine running under MS-DOS. Its RAM+ card for the IBM PC is a high-quality product with an interesting feature called *Flash Disk*.

The RAM+ card is slightly over 10 inches long, and the integrated circuits are in sockets. The serial port uses the same I/O support chip (the INS 8250 UART) fa-

vored by IBM and other board manufacturers and makes the board completely

APPARAT'S configuration permits the PC to communicate with a modem and a serial printer simultaneously.

compatible with all standard IBM PC communications software.

Two slide-on jumpers allow the serial board to be addressed as either port 1 or port 2. It can be used in a two-port configuration with the normal IBM serial card or with any of the other cards in this review. Since the RAM+ card includes only one communications port, space for a connec-

tor is not at a premium, and a standard DB-25 male socket can be used for the serial port.

The RAM memory on the Seattle Computer RAM+ card is contained in up to four rows of 64K chips with nine chips in each row. Mitsubishi made the 64K chips on the board supplied for review. All of the RAM sockets are mounted on every card shipped, regardless of the amount of memory ordered. Users can start with a 64K expansion card (one row filled and three empty) and add memory as needed by plugging in more chips and changing a few switch settings.

The ninth chip in each row is used for parity checking in the same manner as the memory on the IBM main board. Parity checking detects a memory read error and reports it to the computer. The IBM PC's normal response is to halt whatever it is doing and report "PARITY CHECK" on the screen. This is usually appropriate since the questionable data may cause either a crash or incorrect results.

The presence of parity checking is an important consideration in choosing any

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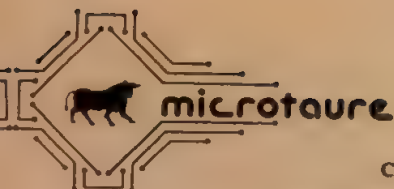
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CIRCLE 328 ON READER SERVICE CARD

Minimum System requirements: IBM Personal Computer with BOTH color & monochrome screens - 256K Memory - One disk drive

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(613) = 745-6661

RAM expansion board for the IBM PC. It is easy to tell if parity checking is available on a RAM card; there will be nine memory chips in a row instead of eight.

The RAM+ card adds a special feature to the parity-checking scheme. The RAM+ card has four red lights that correspond to the four rows of memory chips. If one of those rows generates a parity error, the light comes on and stays on until the system is reset. This feature certainly aids the user in troubleshooting memory and parity problems. RAM+ also allows the parity checking to be turned off when the user is running a memory test or getting false reports.

Most programs for the IBM PC will run on 128K of RAM or less. Additional system RAM usually sits idle, but considering the continuing decrease in RAM memory prices, it is practical to load the system memory with RAM and use the excess capacity to imitate a disk. One way to implement this is with a so-called RAM disk.

The major manufacturers of RAM expansion cards now make it possible to use a portion of the system RAM as a simulat-

ed mechanical disk. Data can be read to and written from this simulated disk just

**USERS CAN
start with a 64K
expansion card and
add memory as
needed by plugging in
more chips and
changing a few switch
settings.**

as it would be to a mechanical disk, only hundreds of times faster than by the PC's relatively slow 5¼-inch disks. How much faster depends on the kind of mechanical disk in use and the amount of disk activity in the program. Programs with little disk activity will show little gain, but programs

such as mailing lists, data bases, inventory, or accounting packages will demonstrate substantial gains in operating speed.

Using a RAM disk memory does have one operational drawback. Everything in the RAM is lost when the power is turned off. If the user forgets to save a needed file to a "real" mechanical disk before shutting off the machine, or if there is even a momentary power failure, the data will be lost. Frequent transfers of data to a real disk must become a standard operating practice for RAM disk users.

Seattle Computer supplies a software package called *Flash Disk* for use with the RAM+ card. It comes on a disk with the RAM+ and is licensed to run only on systems using the Seattle Computer RAM+ card.

Flash Disk must be used with PC-DOS 1.10 and will not operate with any earlier version of DOS. To install the *Flash Disk* package, the user runs a .COM program on the supplied disk, which modifies the operating system for *Flash Disk* operation.

Flash Disk shares the system memory with the regular RAM user space. The sys-

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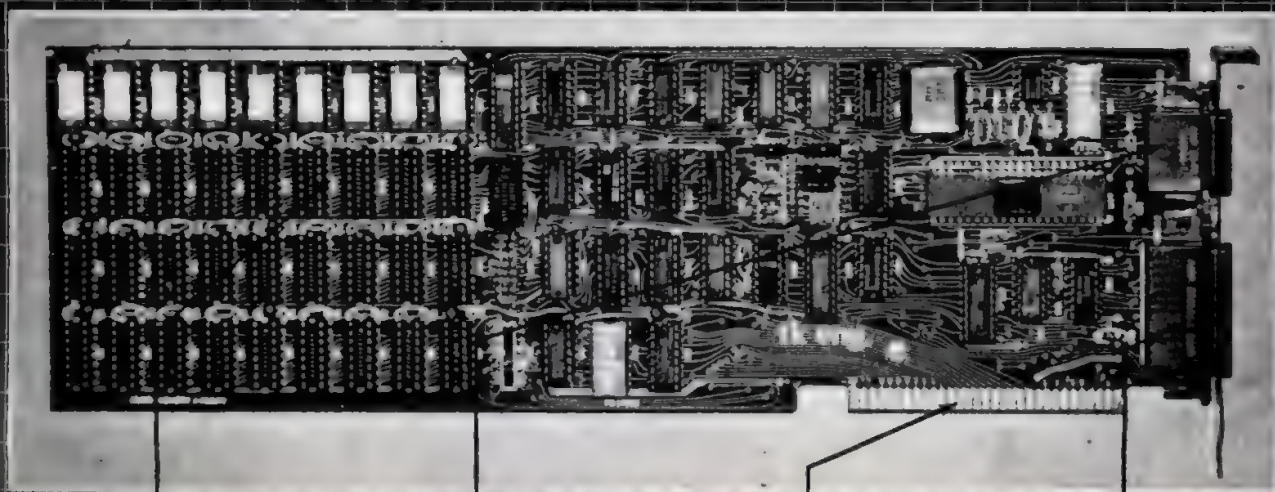
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CIRCLE 354 ON READER SERVICE CARD

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tem memory is divided by changing switch settings on the PC's main system board. At least 32K has to be devoted to system RAM and all the remaining RAM can be devoted to the *Flash Disk*. *Flash Disk* becomes drive C in the operating system and C becomes the default drive; all files copied to C go to the integrated circuit memory instead of going to a mechanical drive.

The difference between an ordinary PC and one equipped with a 256K RAM+ and the *Flash Disk* is much like the difference between a compact sedan and an expensive touring car. They will both get the driver there, but one does it with greater speed and more style.

One advantage of the RAM+ from Seattle Computer is that it costs significantly less than other alternatives. The 64K RAM+ board comes complete with the *Flash Disk* and the serial port, and it is available from local computer stores and other retailers. Current RAM+ owners should check with their dealers to obtain a copy of the *Flash Disk*.

Quadram Quadboard

The user who has a PC equipped with a color/graphics adapter, disk drives, and 64K system memory may want to communicate through a modem, to send data out to a parallel printer, and also want RAM disk operation and more system RAM. Finally, a clock would be a useful feature to help develop a system for unattended operation. All this is available with a Quadboard.

Quadram produces a complete family of cards for the IBM PC in Norcross, Georgia. Quadram is best known for its original card, the Quadboard, but its other products, such as the MicroFazer print spooler, have been getting quite a bit of attention lately. The Quadboard contains both an RS-232C serial port and a parallel printer port, up to 256K of RAM, and a clock/calendar. The Quadram-Drive provides RAM disk operation.

Because of a unique mounting requirement, Quadram recommends putting its 13¼-inch Quadboard in the PC's second slot. Quadram solved the connector problem by providing a short cable and DB-25 female socket for the parallel printer interface. This socket is mounted in the existing hole in the back wall of the PC cabinet. A plastic cap covers that hole. With the cap removed, the user can put the

socket in with two screws, plug the cable into its socket in the card, and install the card in the normal manner. This method of installation provides two standard connectors for all IBM peripherals.

The parallel and serial ports are functionally identical to the standard IBM equipment (the INS 8250 UART chip), and they can be designated as the main port (1) or as an auxiliary port (2) when used with another serial or parallel card. Port addressing on the Quadram card is selected by setting DIP switches instead of using jumpers.

The Quadram clock/calendar uses a crystal-controlled, special-function integrated circuit and a backup rechargeable battery. Quadram also supplies a disk containing a program that checks the functioning of the clock and sets the system date and time to match the Quadboard clock.

Though written in BASIC, the program is easily integrated with a batch file to be run whenever the system is booted up. A separate BASIC program allows the clock to be set as needed.

The memory section of the Quadboard

```

      AAA      TT
      AAAA     TT
      AA'AA    TT
      AA  AA UU  UU TTTTTT 000 PPP RR RR 000
      AAAAAA UU  UU TT 00 00 PP PP RRR RR 00 00
      AA  AA UU UU TT 00 00 PP PP RR 00 00
      AA  AA UU U TTTT 000 PPP RR 000
                PP
                PP

```

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for delivery.**

CIRCLE 172 ON READER SERVICE CARD

includes full parity checking and reporting. A DIP switch can be used to turn parity checking off. The RAM is made up of four rows of 64K chips with nine chips in each row. The Quadram board can be or-

P_{ORT}
addressing on the
Quadram card is
selected through the
use of DIP switches
instead of jumpers.

dered with memory in multiples of 64K up to 256K. The sockets are included on boards with less than 256K, so memory on the board can be easily expanded. Motorola made the RAM chips on the Quadram board supplied for review.

Quadram's version of a RAM disk, *Quad-Drive*, is a separate program that works with any version of PC-DOS. The user can set the number of 32K blocks of memory to be allocated to the Quad-Drive when calling up the program. Typing QD 2 initiates the RAM disk operation to which two 32K blocks of system memory will be allocated. *Quad-Drive* requires that the user allocate 64K for RAM. Typing QD 0 restores the system to normal operation, freeing all available memory for use by the system as RAM.

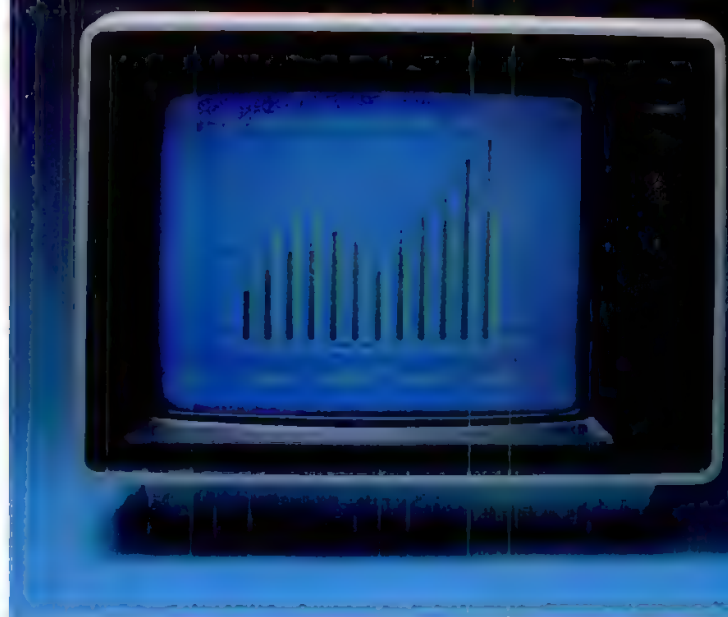
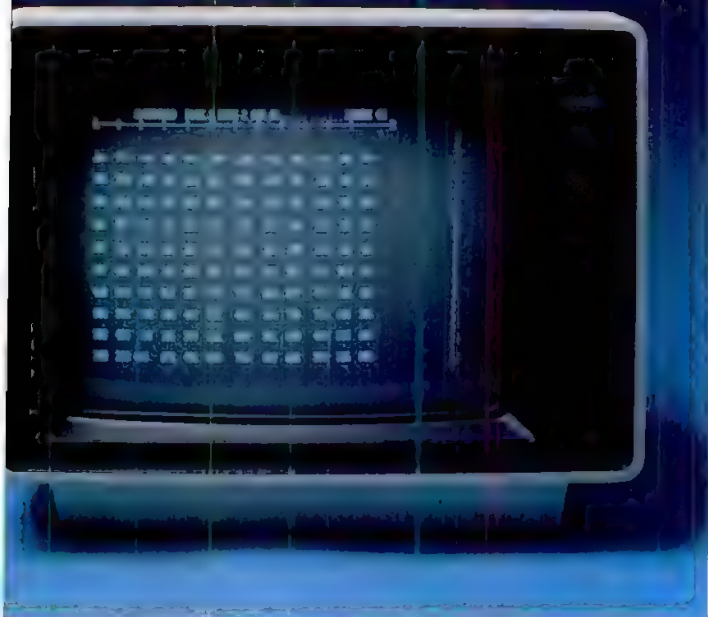
Users who own a Xedex Baby Blue Z-80 card for the PC will be happy to know Quad-Drive works with Baby Blue. The Z-80 operates as if the banks of RAM allocated to Quad-Drive made up a mechanical disk. The Baby Blue can also use the ports on all of the boards tested. Some special software, however, would be needed for the Z-80 to get the time from the clocks.

Well-written and easy to follow, Quad-board's manual divides sections logically and provides a good table of contents. The manual is sized and punched to fit into the IBM system documentation binders.

All Quadboards come with Quad-Drive software. Owners of older Quadboards should check with their dealers or with Quadram for a free copy of Quad-Drive. /PC

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THIS!



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System Requirements

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- Λ 64k memory
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- Λ Color/Monochrome monitor that plugs into the color/graphics board
- Λ (Optional): IBM® cps dot matrix printer with Epson Grafrax-80® or Epson MX-80® matrix printer with Graphtrax-80®
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The Graphics Generator includes two diskettes and 160 page documentation manual. (1982/ISBN 0-89303-266-2/D2662-7)

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NOTEPAD, created by Infomedia Corporation in San Bruno, California, is now used nationwide by the nuclear power industry to swap information and ideas in an



Conference

effort to avoid accidents such as the one at Three Mile Island. Special interest groups are also taking advantage of this unique electronic conferencing system. Sixty representatives of more than 45 companies have joined a NOTEPAD conference on environmental regulatory issues, and over 30 office automation consultants and long-range planners regularly discuss office

automation ideas on their NOTEPAD computer conference, Business Intelligence.

With computer conferencing, people with similar interests can communicate from all over the world via computer files that they jointly create. (See "The Virtual Conference," PC, April/May 1982.) Users access these files through software such as

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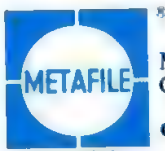
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CIRCLE 399 ON READER SERVICE CARD

NOTEPAD on a host computer system, and they can review files or contribute to them as needed. Password codes ensure that users access only those conferences in which they are registered.

Unlike video conferencing, which requires participants to be in designated places at predetermined times, computer conferencing allows users to interact simultaneously, like a telephone conference call, or in delayed time, like a smart message service with unlimited memory. Through Business Intelligence, for example, subscribers in Australia, the United States, and England can trade current information on the use of office automation technology. With the trends and data they receive on effective and not-so-effective new devices, Business Intelligence members can save their companies considerable time and money.

At a McGraw-Hill symposium on international teleconferencing held during October 1982 in Secaucus, New Jersey, over 150 communications experts, vendors, and users were treated to a demonstration of **NOTEPAD's** Business Intelligence conference. Participants viewed a large display linked to the host computer in California. They watched as Larry Kalish, Infomedia's eastern regional sales manager, typed his name, received clearance from the computer, and joined the electronic conference. Larry caught up with the conversation, which included Hans Puehse, an executive with Fireman's Fund, Christine Bullen, who studies communications media and office automation at MIT, and myself.

Now joining: Puehse (Hans)

121 Vallee (Jacques) 7-Oct-82 10:21AM-PDT
Good morning Hans! The conference in New Jersey is going well. We will be combining audio conferencing and computer conferencing in a series of presentations on project

management. Can you participate for a while today?

Now joining: Bullen (Christine)

122 Vallee (Jacques) 7-Oct-82 10:25AM-PDT
Hello, Christine! I look forward to the exchange of information with the participants in New Jersey. I expect Ruthie and Larry will be keeping us informed of their comments and questions.

123 Bullen (Christine) 7-Oct-82 10:27AM-PDT

Glad to be here. We are also joined today by my 3-year-old daughter who thoroughly enjoys computer conferencing!

124 Vallee (Jacques) 7-Oct-82 10:28AM-PDT
What is your daughter's name, Christine?

125 Bullen (Christine) 7-Oct-82 10:29AM-PDT

Her name is Valerie. She especially enjoys "pushing the RED button"—on my terminal that is the carriage return. What is the schedule of events at the conference?

Overseas Calling

NOTEPAD's Business Intelligence conference has run continuously since it was organized in June 1981. The service links subscribers in an invisible worldwide network from Australia to England, Canada, and Japan. It is available 24 hours a day, 7 days a week.

Iris Schenke, a management consultant who specializes in international operations, joins the conference to describe how she uses **NOTEPAD** to handle her international projects, while Hans Puehse explains that he finds it well suited to matrix management. Because the system uses only three commands (striking a 1 to write a note, a 2 to read, or a 3 to move to another conference), it is extremely easy to use.

126 Puehse (Hans) 7-Oct-82 10:32AM-PDT
Hi to everyone. I am pleased to participate

in this conference since computer conferencing has been of substantial interest to me since Jacques and Infomedia introduced me to it and I had a chance to use it extensively over an 18-month period organizing the AFIPS sponsored [American Federation of Information Processing Society] Office Automation conference in San Francisco this year. I am located in San Rafael, Ca.

Now joining: Schenke (Iris)

127 Puehse (Hans) 7-Oct-82 10:35AM-PDT
Computer Conferencing in a Matrix Organization with geographical dispersion of personnel—

I am developing plans to pilot this concept in an environment where Line-of-Business managers, located in branches around the country, reporting to a Line-of-Business Executive in the Home office can improve their decision-making and communication skills. A significant obstacle at this time is finding a suitable terminal (easy to use—like **NOTEPAD**) with auto-dial, programmed log on procedure, that is affordable (100–1200 price range).

128 Schenke (Iris) 7-Oct-82 10:36AM-PDT
Hello Christine, Valerie, Hans, and Jacques! We have a beautiful morning in San Bruno. With **NOTEPAD**, I have just finished telecommunicating with Israel, Australia, Austria, the United Kingdom, Canada, and Japan.

The discussion turned to crisis management as Joseph Ehardt of the Seybold Office Automation Group joined in.

129 Vallee (Jacques) 7-Oct-82 10:37AM-PDT
One area of project management where the applications of this medium are obvious is the handling of crises. We often think of a crisis as something that happens very quickly and is all over in a few hours, like a fire. In fact, crises may require very careful management of information and communi-



cations over weeks or even months. I am thinking in particular of business, marketing, or industrial crises related to specific Products—like Proctor and Gamble's toxic shock syndrome crisis or the current Tylenol crisis.

Now joining: Ehardt (Joseph)

130 Ehardt (Joseph) 7-Oct-82 10:39AM-PDT
Greetings to Jacques, Hans, Christine and Iris. It seems that we have both the East and West Coast represented in this conference.

133 Bullen (Christine) 7-Oct-82 10:42AM-PDT

I agree with what Jacques is saying. My most effective use of computer conferencing came when I had to coordinate people all over the US to produce a presentation. The crisis came when one of us—ME—hurt my back! It became impossible for us to get together, even for the final run through. Without this form of communication it would have been a disaster. Instead it was a well run and received session.

135 Puehse (Hans) 7-Oct-82 10:43AM-PDT
It seems the Medfly crisis would have also been an ideal candidate: give the project members field terminals.

Each entry made in this example is in the public record section of *NOTEPAD* and can be retrieved by the members according to date, author, and contents. Private notes can be exchanged between members; they are visible to the sender and receiver only. Only the public record is reprinted here. Numbers 131, 132, and 134 were omitted for brevity.

Future Considerations

Next the participants turned to their favorite topic, the discussion of new technologies for networking. They referred back

THE PC is becoming increasingly important to **NOTEPAD users.**

to some earlier announcements and wild rumors that had been circulating among the group. Brad Gibbs, a communications expert at the NASA/Ames Research Center, joined the conference.

140 Puehse (Hans) 7-Oct-82 10:51 AM-PDT
I have just reviewed the news item in *NOTEPAD* about specific companies having trouble in office automation (OA). It is quite sad in a way, but not a surprise. IBM seems to be gearing up by reducing its emphasis on Distributed Processing by 1986 and pressing hard on OA strategies. They have just announced an Information Systems Management Institute course "Planning for Office Systems."

142 Ehardt (Joseph) 7-Oct-82 10:57AM-PDT
The news about technical trends is interesting, because many expected Ethernet to fail (due to technical or marketing argu-

ments) and their systems eventually to be good sellers. The 860 is selling very well in 1982 after 1981 was average. The Memory-writer electronic typewriter is about 200% of sales targets also. And so on. It seems that Ethernet is finally getting the cost edge that Xerox hoped when it brought Intel and DEC into the agreement.

Now joining: Gibbs (Brad)

143 Gibbs (Brad) 7-Oct-82 10:59AM-PDT
Good morning to all from sunny and warm California. I am on vacation this week but with a borrowed terminal I can keep in touch very well. With reference to crises I understand the State of California is also looking at their emergency communications.

Now leaving: Bullen (Christine)

Brad Gibbs' borrowed terminal is a portable Texas Instruments unit. Because *NOTEPAD* recognizes almost all common keyboard devices, participants use IBM PCs, cathode ray tube devices (CRTs), and even word processors. The PC is becoming increasingly important to *NOTEPAD* users. With PCs, members can prepare text off line and link their communications activities with other programs. A file could be created with *SuperCalc*, for example, and then transmitted through *NOTEPAD* to associates throughout the world.

Topics for Discussion

With most *NOTEPAD* conferences, the Business Intelligence conversations covered many topics in a short time. Partici-

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pants turned briefly to a discussion about who uses computer conferencing and how to control real-time discussion. (Because many people can be on line simultaneously in computer conferencing, NOTEPAD will allow a leader or facilitator to control the synchronous, or real-time, discussion.)

154 Ehardt (Joseph) 7-Oct-82 11:09AM-PDT Jacques. I know NOTEPAD is used by many organizations in the US for project or crisis management. Perhaps you could tell who uses it overseas?

157 Vallee (Jacques) 7-Oct-82 11:11AM-PDT Re. 154. Among the applications outside the US are Pilkington Glass in Liverpool England (Denis Loveridge, who is a member of this conference, is with Pilkington) as well as the French Utility company (Electricite de France) and Renault. The system is also used by banks in Sweden and by the Australian Overseas Telecommunications Commission, which is developing the MIDAS network. Additionally, major international engineering projects handle a large measure of their project information over NOTEPAD, including the Northwest Shelf LNG project in Australia and the OK Tedi copper and gold mine project in Papua New Guinea.

163 Puehse (Hans) 7-Oct-82 11:19AM-PDT One question to Jacques as NOTEPAD's Godfather: How in a computer conference does the Leader or Facilitator assume control?

164 Vallee (Jacques) 7-Oct-82 11:21AM-PDT The system is designed to accommodate very different management styles—from a very

dictatorial style where all the interaction is in the form of answers to votes or questionnaires, to a very "democratic" style where anyone can make entries at any time.

***M**OST USERS felt comfortable with the system in a few hours.*

165 Vallee (Jacques) 7-Oct-82 11:21AM-PDT Still on the issue of "control": The organizer has a whole range of options. Participants can be made "observers"—in which case they can only send private notes and review the existing public record. The ability to send private notes can also be inhibited for the entire group. This has interesting psychological and legal implications, of course. There are situations where you want all interaction by the group to be "on the record" (e.g. antitrust implications).

166 Puehse (Hans) 7-Oct-82 11:23AM-PDT Jacques, how do you deal with dominance?

167 Puehse (Hans) 7-Oct-82 11:24AM-PDT Could you give the "electronic floor" to a designated person?

168 Vallee (Jacques) 7-Oct-82 11:24AM-PDT Dominance in NOTEPAD can be dealt with in

several ways. People making long entries are often ignored or bypassed by the flow of interaction among those with shorter entries, which get distributed faster.

169 Ehardt (Joseph) 7-Oct-82 11:25AM-PDT Shorter entries help people more quickly grasp points as well. Your comment about quick distribution is evident by the numbering of the entries. The number is assigned when someone starts typing the comment, but someone else can finish beforehand. All in all, synchronous conferences work very nicely, although we use NOTEPAD principally as an asynchronous system because of time zone differences. Electronic mail systems would never do for what we are doing this morning (I'm on the West Coast).

Joseph Ehardt's observations about electronic mail are correct. Because it is not designed for discussion or dialogue, electronic mail cannot handle several users on line at once. Computer conferencing presupposes that two or more participants need to discuss something simultaneously. It is designed to accommodate these kinds of needs. Electronic mail must have a designated receiver before the communication is sent. Computer conferencing messages, however, need not go to anyone in particular. Like electronic mail, however, the computer conference allows users to send private messages to selected individuals.

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scribers to this particular NOTEPAD conference pay a flat fee of \$20 per hour—less than 35 cents a minute. Costs for other conferences, such as project management applications, can average \$1 per minute. This represents a savings over international phone calls, which routinely cost \$100 or more. Unlike telephone conferencing, computer conferencing supplies hard copies of the discussions, to be used as needed.

The conference was joined by professor David Swift, a sociologist at the University of Hawaii. He was bombarded with questions about his appraisal of computer conferencing and video techniques. A typical exchange follows:

176 Ehardt (Joseph) 7-Oct-82 11:43AM-PDT
David, I understand you have slow-scan video. [Slow scan is a technique of putting a document or still picture through a closed network to a television monitor far away.] Could you describe how you are using it for us?

177 Swift (David) 7-Oct-82 11:46AM-PDT
In response to Joseph Ehardt's question

about slow scan, I have been using it for research and teaching to connect myself and my students with specialists thousands of

COMPUTER conferencing hits that median ground between a telephone call and a memo.

miles away. Slow scan (and computer conferencing) are especially important to me for two reasons: cost and distance. Through the assistance of Infomedia and Colorado Video, I have been able to use these long-distance communication devices. This spring, for example, I had audio and slow scan (still picture) two-way conversations with space scientists at Jet Propulsion Laboratory in Pasadena, NASA/Ames at Moffett Field, a pioneer radio astronomer (John Kraus) from

his farm home in rural Ohio, and conversations (illustrated by slow scan) with people in NASA headquarters in Washington, D.C. I also plan to use telecommunications for gathering information on scientists involved in various aspects of the space program, for books and articles I am writing (for example, on the first scientists to seriously consider searching for extraterrestrial intelligence). These people are scattered all over the US and also in Switzerland, the USSR, and Japan. So, to summarize, slow scan, audio, and computer telecommunication will be helpful to me in teaching and in gathering information for my research projects.

New participants came in, from Liverpool to San Francisco. The conversation became more general, branching into new topics while keeping a very informal character. Susan Wintersteen at Bechtel headquarters and Mary Connors at NASA/Ames joined in the exchange:

179 Vallee (Jacques) 7-Oct-82 11:50AM-PDT
Right now we have people in this conference all the way from Hawaii to New Jersey, where

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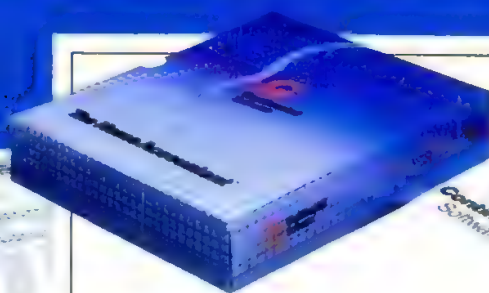
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Larry and Ruthie are making a live presentation. Brad and Hans are in California as well as myself. I don't know where Joe is currently.

Now joining: Wintersteen (Susan), Connors (Mary), Loveridge (Denis)

180 Ehardt (Joseph) 7-Oct-82 11:53AM-PDT
I am in the San Francisco area. I notice that Denis Loveridge has joined us from England.

181 Wintersteen (Susan) 7-Oct-82 11:53AM-PDT

Hello from San Francisco and a special hello to Larry and Ruthie. I thought I would comment on Bechtel's use of NOTEPAD for project management. Specifically, Bechtel has used NOTEPAD on a number of projects in a pilot test. Major impact has been the improved communications between the San Francisco office and the project sites. There is a greater feeling of management control because headquarters personnel were able to document progress of the projects, keep an audit trail of Bechtel and client discussions to get every decision clearly documented. Few of the participants had extensive typing skills or computer knowledge.

Most users felt comfortable with the system in a few hours.

182 Connors (Mary) 7-Oct-82 11:53AM-PDT
With all you folks in New Jersey it gets lonesome out here in California. I just want

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to wish you a happy meeting and thank you for the opportunity to participate. For those of us with no travel budgets this is the only way we get to most meetings. I will be anxious to hear a report on the status of international teleconferencing. I would point out one advantage of the system that perhaps I am the only one sneaky enough to appreciate. That is, that computer conferencing hits that median ground between a telephone call and a memo. It doesn't have the ethereal

nature of a phone conversation, allowing at least some record of the exchange, but it doesn't set up the hostile relationship that a memo frequently does when the other thinks you're keeping book on him. Have fun and don't eat too many hoagies.

Finally, the conversation focused again on international applications. From England, a planning expert greeted the group, while others reviewed their practical experience with computer conferencing.

186 Loveridge (Denis) 7-Oct-82 12:00PM-PDT
Good evening from a very wet Ormskirk in Lancashire in the United Kingdom.

187 Schencke (Iris) 7-Oct-82 12:06PM-PDT
Let me describe another example of international conferencing: NOTEPAD is being used by two major construction firms located in Oakland and Houston with offices in Perth and Sydney for the management of an enormous project in which three oil companies, from the Netherlands, the United Kingdom, and Japan are involved. The project use of NOTEPAD is just starting. The participants will be using 3M WhisperWriters at most locations. Every participant will be supported

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188 Connors (Mary) 7-Oct-82 12:09PM-PDT
I should provide a brief summary of some of the teleconferencing activities we are engaged in. Here at NASA/Ames since the Apollo days we have been part of a NASA-wide 4-wire audio conferencing system. With the advent of the Communications Technology Satellite (CTS) in 1976 we began experimentation with full-motion video conferencing. We are now again video conferencing among centers through the shuttle satellite line. Computer conferencing has been used to plan experiments that were conducted on CTS as well as for various other applications. We are presently working with David Swift and with Colorado Video in using slow scan to supplement certain audio conferences and especially to NASA locations not currently on the shuttle network.

190 Gibbs (Brad) 7-Oct-82 12:17PM-PDT
It's been fun and I hope beneficial to those attending the conference in New Jersey. Must close for lunch and pm activities. Cheers to all from the West Coast!

192 Kalish (Larry) 7-Oct-82 12:25PM-PDT
We are going to leave the conference now. Thanks for your participation, and good-bye from McGraw-Hill Headquarters.

COMPUTER conferencing *presupposes that two or more participants need to discuss something simultaneously.*

Now leaving: Kalish (Larry)

So another day in the life of the Business Intelligence conference appeared to come to an end. But did it? It was noon in San Francisco, and 3 p.m. in New Jersey. Night had fallen in Lancashire, where

Denis Loveridge was relaxing at home while watching our conversation develop over his computer terminal. In Hawaii the morning activities had barely begun for Professor Swift. Soon users of NOTEPAD in Australia, New Guinea, Taiwan, and Japan would wake up, turn on their terminals, and make the local phone connection that would get them on the network.

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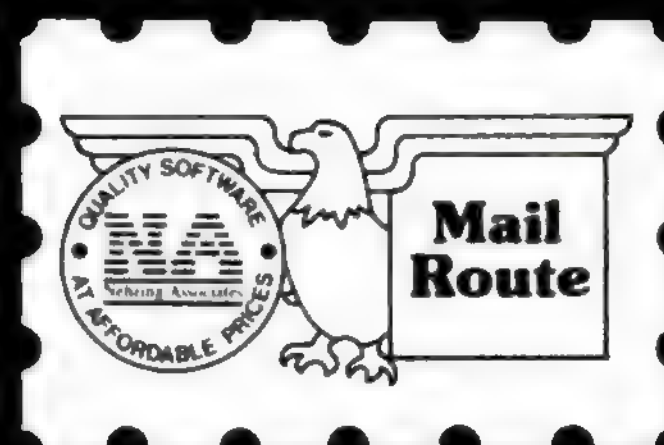
Dr. Jacques Vallee, founder of Infomedia Corporation, pioneered the design of the first network-based computer conferencing system. Prior to founding Infomedia in 1976, Dr. Vallee worked at Shell, RCA, and Stanford University. His most recent book is *The Network Revolution: Confessions of a Computer Scientist* (1982, And/Or Press, Berkeley).

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- | | |
|--|---|
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| Chart of Accounts with summary dollar amounts | Income Statement with prior year comparison |
| Chart of Accounts with this year/ prior year summary amounts | Departmental Income Statement(s) |
| Daily Transactions Report | Departmental Income Statement(s) with prior year comparison |
| Itemized Monthly Transactions | Detail report for individual accounts |
| Balance Sheet | Trial Balance Statement |
| Balance Sheet with prior year comparison | |

Accounts Receivable

- | | |
|--|-------------------------------|
| Daily Transactions Report | Summary Aging Report |
| Invoices (with or without pre-printed forms) | Detailed Aging Report |
| Statements (with or without pre-printed forms) | Itemized Monthly Transactions |
| | Customer Account Report |
| | Customer Activity Report |

Accounts Payable

- | | |
|----------------------|----------------------|
| Daily Voucher Report | Transaction Register |
| Daily Credit Report | Open Voucher Report |
| Check Printing | Aging Report |
| Check Register | List of Vendors |
| Vendor Status Report | |

Payroll

- | | |
|-------------------------|--|
| Employee Master Listing | General Ledger Transfer Report |
| Tax Table Listing | Quarterly Summary Report (State unemployment info) |
| Payroll Check Register | 941 Worksheet |
| Paycheck Printing | W-2 Printing |
| Monthly Summary Report | |

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GL	400 Accounts	800	1,600	7,000
AR	400 Customers	800	1,600	7,000
AP	400 Vendors	800	1,200	7,000
PR	400 Employees	—	—	—

SYSTEM REQUIREMENTS

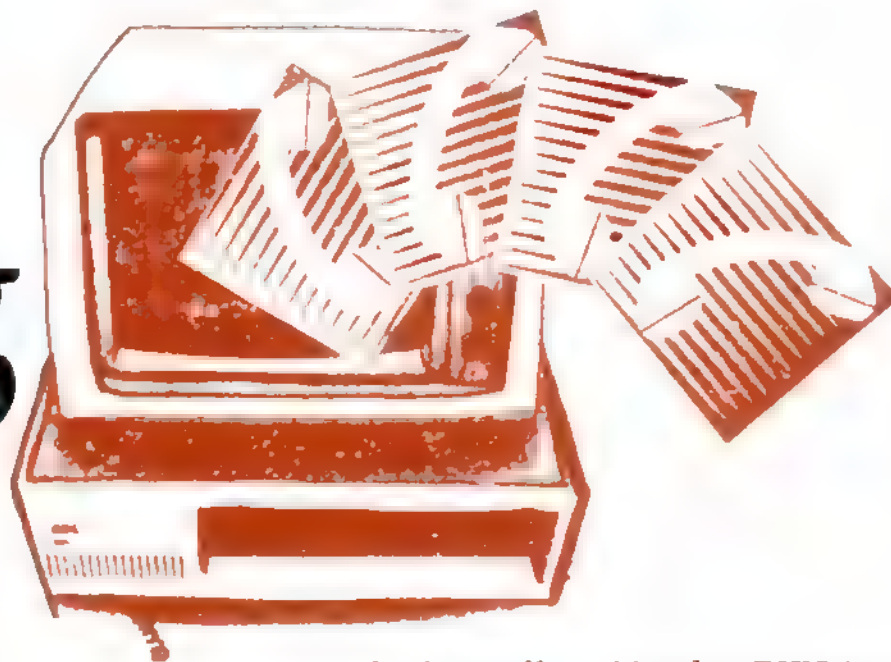
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Lively electronic conversations attract users to EIES, a conferencing system that uses free speech to create data bases from the inside out.

Computer Conferencing With EIES



For the past 3 years, I've been eavesdropping on hundreds of people. But I couldn't have done it without the help of a computer conferencing system called EIES (pronounced "eyes"), the Electronic Information Exchange System.

Like other computer conferencing systems, EIES consists of individual conferences in which users converse electronically, either simultaneously or in delayed time, via messages, conference comments, and notebook entries. These communications are stored in and distributed over a host computer system. Conference members can read or contribute to the system files.

Unlike other conferencing systems, however, EIES is an experimental testing ground that allows users to interact in a number of ways. It abounds in group discussions, messages, reportage, poetry, advertisements, complaints, surveys, private management, and sociological experiments. Conferences can be organized on any topic and may easily run to hundreds of thousands of words. By inducing people to try this electronic conferencing system, EIES's current academic sponsor, the New Jersey Institute of Technology (321 High St., Newark, NJ 07123, 201-645-5211), hopes that users will find new applications for computer conferencing.

Opening the EIES

The membership of EIES, which was first sponsored by the National Science Foundation (NSF), originally consisted mostly of academicians. When NSF funding ended in 1980, however, a noticeable drift toward commercial sponsorship began. Many of the academicians formerly associated with EIES are today EIES members trying to nurture their investment. They are being joined by a growing number of businessmen looking for practical, cost-effective methods of communication. EIES is slowly changing from an academic experiment to a commercial testing ground where businesses can evaluate the effectiveness of computer conferencing, electronic mail, and other information service functions.

Observing this process are a few scribes and chroniclers like myself, who are lured by a novel system of recording and distributing written text. As we scroll an ever-increasing, user-created text base, we are often struck by the sensation of eavesdropping on EIES conference participants. Guided by a very practical search system, novices are free to explore the labyrinthine EIES paths as far as our

budgets allow. Not that EIES is expensive as networks go (\$75 per month, plus Telenet connect charges of \$9.50 per hour), but browsing through its 400 megabytes of on-line text (expandable to over 1 gigabyte) at 300 baud is like sampling an ocean with a teaspoon.

Active participation in EIES means more than checking out its conference files, however; it also requires interaction with other members. Outside of a few games, very little applications software is available, and users will find no canned data bases (such as Dow Jones News/Retrieval service) to justify connect time. EIES is a group activity, or a collection of activities based on personal communication. Many other networks are simply on-line data bases that offer no social cohesiveness.

To EIES users, creating the data base before establishing the network of users is like putting the cart before the horse. "The obvious step to take before offering tons of arbitrarily gathered data bases is to form a cohesive network of on-line resources," writes Sangat S. Khalsa, a.k.a. Guru Sangat, 304. (EIES members frequently refer to each other by number as it is much less ambiguous than a name.) By contrast, 304 says The Source, which is mostly data bases, resembles "a city built before any-

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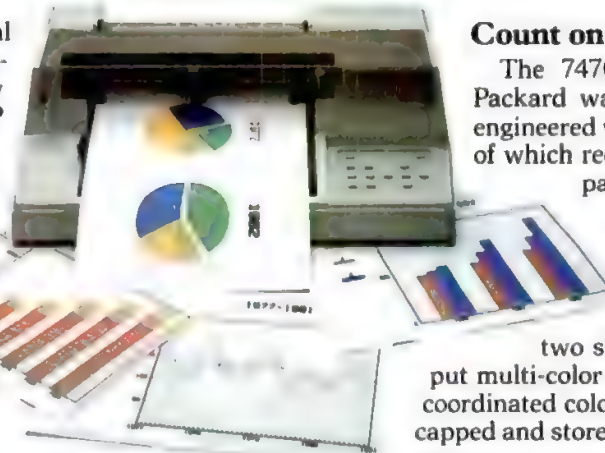
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one moves in." The interactive features, mostly fitted by users in The Source architecture, seem "miles from each other."

Numerous Personalities

Yet how does a user come to feel a part of this socially cohesive network when it is made up of faceless members with numbers for names? Among public communications systems, EIES is one of the few to maintain an elaborate on-line directory in which network members describe themselves. This directory can be searched by name, address, and interest.

There are actually two directories: public and private. The public sector lists the address, telephone number, and a brief description of each member's background and interests. By consulting 304's directory listing, for example, we find that he lives in Vancouver, B.C., works in graphic arts, teaches yoga and meditation, and practices computer communications, all with a sense of humor. ("No," he writes, "I am not a guru.") Passwords and pen names are

kept in the private sector of the directory. They are known only to the user and the Perkin-Elmer host computer.

The pen name is a typically droll EIES feature. Though EIES text is normally signed, it may be signed with a pseudonym. Private messages sent anonymously

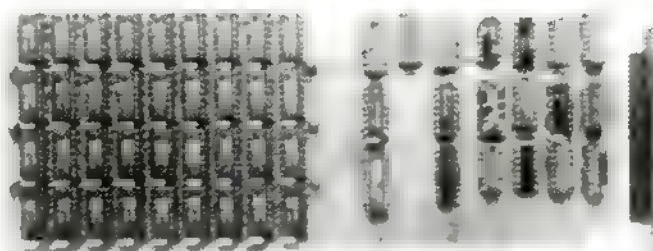
***EIES IS
slowly changing from
an academic
experiment to a
commercial testing
ground.***

are allowed, but they cannot be answered; pseudonymous messages may be answered without revealing the author's

identity. If someone signs a comment as "Alexander the Great" or "Frisco Phil," respondents can send that person a message and be notified when it is received. I once carried on a running argument with a contributor called Vermillion who insisted on publication rights to material submitted under the pen name. I felt like I was arguing with a ghost.

Real people do exist on EIES, however, and I have come to know some of them, both electronically and in person. I have never seen Elaine, 114, but she has helped me in rubbernecking around EIES many times. Elaine lives near Columbus, Ohio, the most thoroughly researched consumer marketplace in the world. Residents of that city are already accustomed to being surveyed and mapped by demographers of every stripe. They reveal their opinions via a CATV-based instant voting system. Columbus is also the headquarters of OCLC, the nationwide cataloguing system for the American Library Association. And Columbus is most familiar to PC

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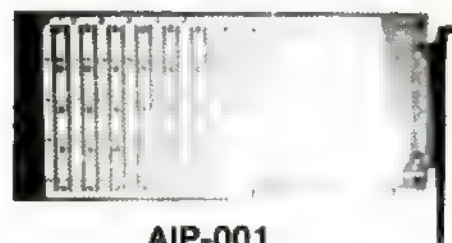
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CIRCLE 367 ON READER SERVICE CARD

readers as the home of CompuServe Information Service.

Although she has a ringside seat for these information superstars, Elaine, 114, does not seem impressed. A sociologist and an early member of EIES, she prefers its more casual ways to the bottom-line relentlessness of industrial networks like CompuServe. From her home in suburban Worthington, she helps develop and document EIES subsystems, and serves as an on-line user consultant. She also uses the network as a consultant in telecommunications.

Users Helping Users

User consultants, a kind of electronic ski patrol, are unique to EIES. They are a cadre of members who are adept at using the system. They know the command structure intimately, and one of them is almost always available online to give quick assistance to the confused. At any EIES prompt, typing the simple command **???** followed by a query automatically

sends a message to an on-line consultant.

Another EIES colleague, Tom Hargadon (Open Systems, 801), is a leprechaun who attempts to track the office automation market for the newsletter he writes

B*ROWSING
through 400
megabytes of on-line
text at 300 baud is like
sampling an ocean
with a teaspoon.*

with Richard Dalton (Keep/Track, 334). Online, Hargadon contributes terse reports on new developments in telecommunications. Hargadon hails from the days when EIES users played with computer conferencing for the fun of it and

published a chatty on-line newsletter called "Chimo" once a week. "Today," he says, "EIES has moved away from this chummy ambience to a faster, more commercial mode that it may not know how to sustain." He doubts that EIES has the potential to become a truly commercial network, although he has tried unsuccessfully to help that process by putting a news data base online.

EIES on the Bottom Line

With more emphasis on income-producing activity, EIES has become more private and less communal. The most active conferences are those with commercial purposes like Conference 700 (C700) on "many-to-many" communications, and C96 on continuing education (CONED). CONED, a free, on-line university, is the current effort of EIES founder Murray Turoff (Murray, 103) to promote computer conferencing in the world of commerce as a vehicle for teaching. Several courses, mostly relating to computers, are already

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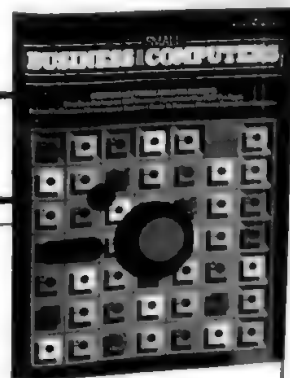
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online. CONED was designed so that anyone with an account may offer a course. This anarchistic approach has given rise to some complaints that the program lacks control over the quality of the courses offered.

Turoff and his partner, Starr Roxanne Hiltz (Roxanne, 120), have written a book on computer conferencing called *The Network Nation* (Addison-Wesley, 1978) and have evangelized extensively for the medium at flesh-and-blood conferences.

A physicist turned computer scientist, Turoff is trying to devise a way for EIES to become economically self-supporting in the face of rapidly rising communication costs, while continuing to provide an experimental environment in computer conferencing. Last year he successfully lobbied the New Jersey Institute of Technology for a more powerful host computer on the grounds that it would pay for itself. CONED is one source of income as users access the courses via an EIES membership.

Testing and measuring like an athlete in training, EIES assiduously studies itself as it grows. It requests corporate members to take part in its many surveys, and Hiltz, in another on-line ID as Evaluator (EVA, 105), issues a continuing stream of reports on network usage, demographics, and practices. Of late, Elaine, 114, has joined her in this work.

EIES strives to be self-sufficient, but the system is not in business to make mon-

ey. Turoff makes clear that EIES, unlike other networks, is technology-driven; it exists to let people try computer conferencing and to identify what kind of soft-

USER *consultants, a kind of electronic ski patrol, are unique to EIES.*

ware is needed for new computer conferencing applications.

Creating an Open Structure

This philosophy lends a certain non-commercial detachment and openness to on-line activity. Users rarely try to manipulate each other to do things their way. Turoff firmly believes in the potential of computer networks to provide free and flexible on-line communications. Users should be able to configure computer conferencing to fit their own needs rather than adapt their needs to fit the fixed structure of the medium.

EIES has an elaborately flexible structure, a multiple command set that enables users to get around online with a set of tools that matches their skill in using the system. The simplest configuration is a four- or five-layer menu scheme; the most

sophisticated is a user-programmable command set written in INTERACT, the EIES programming language.

In an attempt to devise a structure that supports on-line commerce, Turoff designed an electronic marketplace for EIES in which members can advertise and sell each other texts and programs. The EIES software records the transactions and makes the appropriate financial exchanges. Sellers can advertise their goods, while buyers can review these products in a special file.

If, for example, a user sells a product or a service to another EIES member, the buyer may review the item in a special EIES review section. Other potential buyers may then read the buyer's option of the product or service before investing in it themselves. This service isn't likely to be offered in other computer conferencing networks.

While individual users may find some unique touches in EIES services, private companies are attracted by its elaborate software. Because it is user-adaptable and so supportive of a great variety of on-line interaction, firms are eager to experiment with its versatility. Though developed partly with public funds, most of this software remains the property of the firm that wrote it, Language and System Development (LSD) of Bethesda, Maryland. A private firm that wanted to clone EIES was quoted a price of \$50 thousand for the key subsystems.



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CIRCLE 359 ON READER SERVICE CARD

PC MAGAZINE 278 JANUARY 1983

Operating with Ideals

Rather than spawn copies of itself, EIES has chosen to go its own way, experimenting and testing while inducing private companies to bear the burden of cost. The balance becomes more precarious as communications costs mount. Hourly connect time on EIES has risen from \$3.50 to \$9.50 in less than two years, and Tuross worries that higher costs have forced EIES to abandon some of its academic investigations in favor of commercial applications (like office automation and decision support systems) in order to pay the bills. "When there is enough awareness that the public needs access to this technology in the same way that it has access to telephones, we may get some improvement in rate structures and the regulatory process," Tuross concludes, adding that this awareness may not come about in this decade.

Even now a new generation of neophytes is learning the ins-and-outs of human communication via computer in an on-line course [C202] taught by Tuross and Hiltz. Students absorb the mechanics of the new medium while focusing on subjects such as the impact of computers on society.

Whatever its current development pains, EIES remains a creative, experi-

U_{SERS}
*should be able to
configure computer
conferencing to fit
their own needs.*

mental system in a universe populated mostly by special-purpose corporate moneymakers like CompuServe and The Source, and by elite scientific, technical nets like Arpanet and Computer Science Network (CSNET). While others go for profit, EIES remains true to its charter—applying technology to social change. /PC

Clifford Barney, a member of EIES since 1979, has been writing about computer and semiconductor technology for 15 years.



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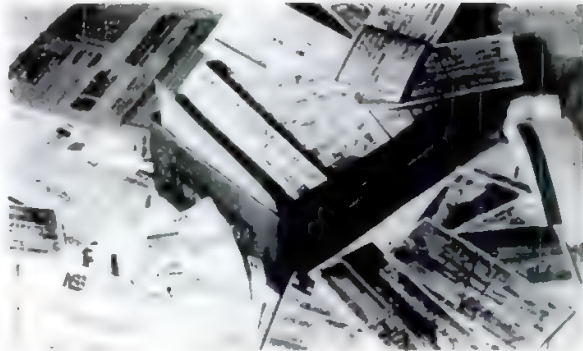
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CIRCLE 202 ON READER SERVICE CARD

The practices and strategy of International Business Machines Corporation largely reflect the personal and marketing principles of its founder, Tom Watson, Sr.

ANATOMY OF A COLOSSUS, PART I

The evolution of International Business Machines (IBM) can be divided into two eras: precomputer and postcomputer. The first era began in 1914 and lasted until the end of World War II in 1945. During this period, IBM was formulating its corporate beliefs and testing them in the marketplace. The second growth era began in 1946 and was characterized by sweeping technological change. In a three-part series, PC explores these two generations and IBM's plans for the future.

What is IBM? Some industry analysts spend their entire careers trying to answer this question. Veteran IBM-watcher Jim Strothman says, "IBM is a moving target." Brian Jeffreys of Strategic, Inc., a market research firm located in California's Silicon Valley, observes that "IBM is not a company, it's an institution."

At the start of the new year, this much can be said about IBM with certainty:

- IBM manufactures everything from office products (text processors, copiers, and dictation equipment) to the densest

logic circuits to date, packaged on the powerful 4300 processor.

- IBM computers and systems are used around the world in tasks as diverse as checking out groceries and making plane reservations to forecasting the weather.

- IBM personnel and computers have helped NASA monitor and control every manned U.S. space flight, including the moon landings.

- Over the years, IBM has spearheaded the development of new technologies that have lowered the cost and extended the range of data processing. The cost, for example, of performing 10,000 computations on an IBM mainframe computer dropped from \$1.26 in 1952 to less than one cent in 1982.

- IBM ranks as the eighth largest industrial concern in the United States. It claims 32 percent of the international computer market, making it larger than the next seven American computer companies combined.

- Its worldwide net earnings for the 6

months ending June 30, 1982 were an astounding \$1.768 billion. Gross income for that same period was \$15.119 billion. Sales increased by nearly 18 percent from the previous year. IBM's meteoric yearly growth rate of over 13 percent is expected to reach 18 to 25 percent in this decade.

- IBM owns 18 manufacturing plants in the United States and 23 overseas plants located in 15 countries. Research and development and product engineering are conducted in 18 laboratories in the United States and seven laboratories abroad. In 1981, IBM had a worldwide total of 341,279 employees.

- IBM is involved in a worldwide construction program that will expand its office space and plant capacity by more than 11 million square feet. During 1980, 25 IBM plants were completed or under construction in the United States and 18 more were under construction in other countries.

- Among the significant new products and technologies announced by IBM in



IBM At A Glance



1981 were the IBM PC; the IBM 3380 computer disk file, which uses thin film technology to read and write data at 3 million characters per second (cps); a new version of the 3081 system—the most powerful computer to date—which has internal speeds up to 40 percent faster than previous versions and provides as much as 32 million characters of main memory to users.

To understand IBM's corporate world view and philosophy, and why the PC fits into its overall marketing strategy, one must return to the company's past. Not that IBM is a backwards-looking company. The corporation's faith in the future and confidence in its own ability was best summed up by IBM President and Chief Executive Officer John R. Opel. At a press conference in 1981, he said, "You can't put new systems and applications concepts on an old device. This industry and technology are so untapped, it's absurd to think we've done it all."

The Father of IBM

IBM has always been closely tied to the pervasive personality and influence of one man, Tom Watson. His son, Tom Watson, Jr., would later write of his father, "His values were to do every job well, to appear neatly dressed, to treat all people with dignity, and to be eternally optimistic and loyal. These precepts he followed conscientiously, in both his personal and his business life." In a eulogy delivered at his father's funeral in 1956, the younger Watson reflected on his father's personality. "He had a peculiar singleness of mind, and he saw things simply. It was because of that simplicity of mind that he could make decisions."

Tom Watson, Sr. was born in 1874, the son of an upstate New York farmer who raised him in a strict moral environment common to the era and the region. The young Watson began his career as a salesman, traveling the towns around Painted Post, New York in a wagon loaded with pianos, organs, and sewing machines.

Watson's ambitions were larger than Painted Post, however, and he soon moved to Buffalo, where he had his first contact with rootless, hard-drinking big city salesmen. Soon the restless Watson moved again, taking a job in 1895 with the National Cash Register Company (NCR) under

***IN OUTLOOK,
spirit, and drive, IBM
is still the company it
has always been.***

the tutelage of John H. Patterson, an aggressive, self-styled businessman who called himself "the father of modern salesmanship." The business of selling cash registers was wide open and brutal then, rife with cutthroat business practices that included harassing the competition and intimidating customers.

Watson survived this harsh environment, and many revolutionary business practices conceived during his tenure at NCR later found their way into the fabric of IBM's corporate culture.

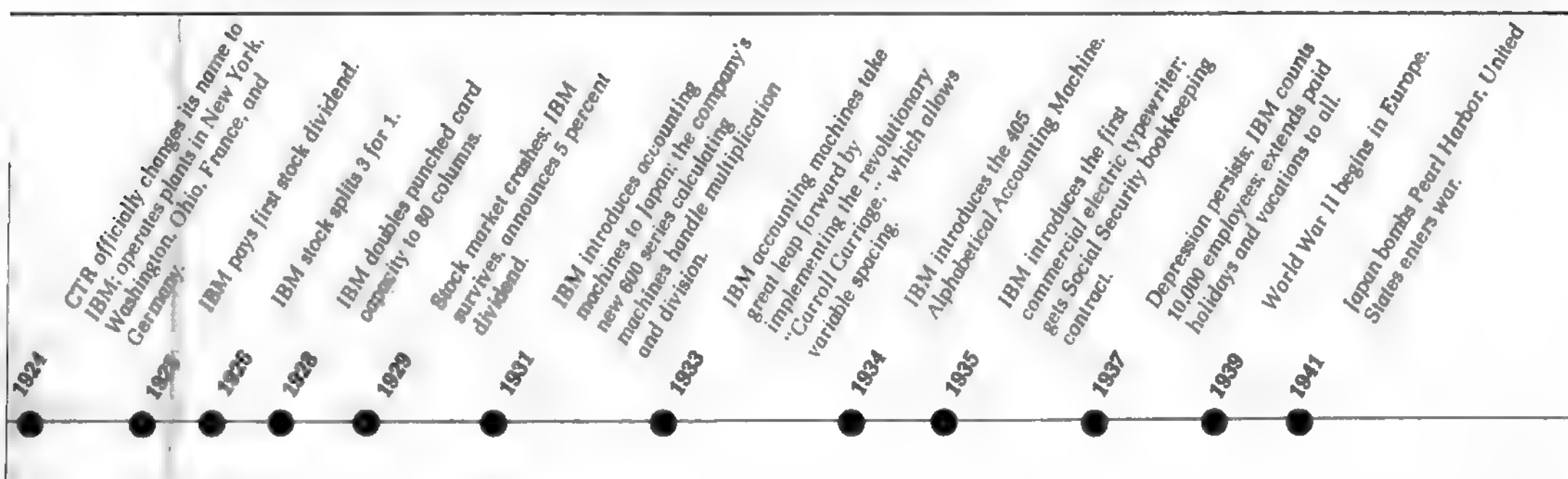
A Hierarchy of Salesmen

IBM's early management philosophies

were developed, according to Watson, Jr., not "by the book" but rather by his father's "instinct for drama." He added that "the real difference between success and failure in a corporation rests on how well an organization brings out the talents of its people." From the beginning, IBM sought to bring out the strengths of its workers by avoiding layoffs, offering job security, and constantly retraining its staff. Key executives (including the last three IBM chief executive officers) have moved up through the marketing ranks, and superior salesmen are commonly promoted to managers of finance, product development, or planning. Thus, as in a primitive tribal culture, longstanding managers, well-versed in the corporate belief system, are promoted to senior management, effectively passing on company traditions and mores.

The corporate spirit that developed during the NCR years has pervaded IBM through seven decades to the present. "In outlook, spirit, and drive, IBM is still very much the company it has always been," Watson, Jr. said in 1963. "For while everything else has altered, our beliefs remain unchanged."

In John Patterson's heyday, NCR staff, particularly salesmen, were treated in an almost militaristic fashion. He used rank, colorful ceremonies, and drama to underscore success. Patterson relied on a disconcerting mixture of security and fear to motivate his salesmen. He employed the carrot and stick approach, offering sales teams guaranteed territories to scour for prospects, a sales quota system, and membership in the 100% Club—an exclusive fraternity of top salesmen who brought in \$30 thousand of business in a year. He initiated a rigorous sales training program, and instigated competitive sales contests,



awarding diamond stickpins as prizes.

From its early years, IBM emulated this style and was always able to recruit, motivate, and develop a superior sales force, characterized by bright, aggressive, and persistent personnel who were advised (in the early NCR era) "to dress in dark suits and ties" and above all, "to sell yourself first." Salesmen were taught to commit themselves to their company and avoid divisional loyalties. They were trained to maintain contact with customers well after a product was paid for, and to continually assess the customer's future product needs. Today IBM salesmen form the backbone of the company's almost legendary reputation for support and service. They help attract and hold IBM's primary revenue source, the loyal data processing corporate customer who is committed to brand loyalty.

Watson's Break with NCR

In 1912, 30 NCR executives, including Watson, were indicted under the criminal provisions of the Sherman Antitrust Act on charges that included stealing salesmen, tampering with competitors' machines, and perpetuating a monopoly. Believing that it would imply guilt, Watson refused to sign a consent decree that would have settled the case out of court. Patterson fired him shortly afterward, a few months before his fortieth birthday. Watson was a middle-aged man, out of work, and his new wife was expecting a baby.

Miles away, another story was evolving, and the two tales would merge to produce the giant corporate colossus whose birth would resonate throughout the 20th century and set the pace of technology for the next 100 years.

IBM's Future in the Cards

In the 1880s, the United States Census Bureau faced a crisis. No existing equipment could keep pace with America's burgeoning population. By the time the 1890 census could be counted, the statistics would be obsolete. Dr. Herman Hollerith, a young statistician employed by the Bureau responded to an in-house contest and invented an electro-mechanical machine

scales, meat slicers, coffee grinders, and an assortment of punched card equipment and awkward tabulating machines that stood on Queen Anne legs.

With Watson's tenure, CTR began to alter its image. Watson changed its name from the prosaic Computer-Tabulating-Recording Co. to the grander-sounding International Business Machines Corporation when it entered the Canadian market in 1917. "I thought it would open far more doors than CTR," he reflected later. From the central invention of the Hollerith Tabulator, the company began producing faster companion machines like the 080 card sorter, which processed 400 punched cards a minute.

IBM's Postwar Triumphs

When World War I was declared in 1914, CTR adapted its computer scale designs for use in shipyards and factories as part of America's peacetime war effort. When the War ended in 1918, fueled by federal leases and postwar inflation, CTR's prosperity continued to rise. The corporation's sales doubled from \$4.2 million in 1914 to \$8.3 million by 1917, and earnings had risen from \$490 thousand to \$1.6 million. Insurance companies, railroad utilities, and government agencies such as the Interstate Commerce Commission began leasing Hollerith Tabulators and Sorters in quantity.

CTR's Washington plant worked double shifts, turning out 80 million cards a month, but it was unable to keep up with demand. By 1920, CTR had tripled gross income, more than doubled sales, and expanded its product line to include scales, cards, mechanical and electric key-punchers (forerunners of the calculator), print tabulators, and a synchronized elec-

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"Of the top 25 industrial corporations in the U.S. in 1900, only two remain in that select company today. One retains its original identity (IBM), and the other is a merger of seven corporations on the original list. Figures like these help remind us that corporations are expendable, and that success—at best—is an impermanent achievement."

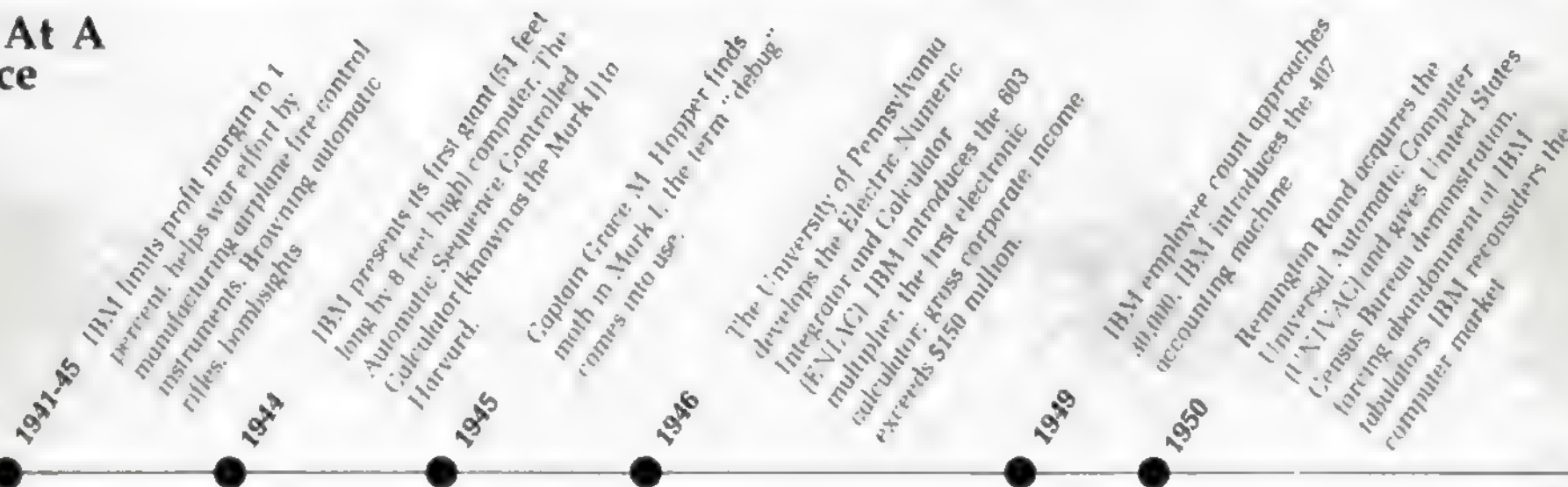
—Tom Watson, Jr.

From *IBM, A Business And Its Beliefs*

that was activated by punched cards. Each hole in the card represented a census statistic. Hollerith conceived the idea in a flash of creative inspiration when he saw a railroad conductor wielding a ticket punch on a train. This invention kicked off the age of data processing.

In 1896, Hollerith founded the Computer-Tabulating-Recording (CTR) Company, a loose amalgamation of three formerly independent firms: Tabulating Machine, International Time, and Computing Scale. In 1914, the newly-unemployed Tom Watson joined CTR as general manager and became president the following year. When Watson took over, CTR's product line consisted of butcher

IBM At A Glance



tric time clock.

The business climate of the twenties was ideally suited to the development of office equipment products. The country's gross national product had risen substantially and concurrent growth in radio, motion pictures, automobiles, home appliances, construction, and steel kept pace. Americans were migrating in hordes to the postwar industrial cities. The market for office equipment was expanding.

Predictably, CTR continued to prosper. By 1924, the year it changed its name to IBM on a corporate-wide scale, the company counted plants in New York, Washington, Ohio, France, and Germany. The first IBM stock dividend was paid to inves-

WARTIME products included aircraft gun control instruments.

tors in 1925. By 1926, IBM stock had split three for one, and the company had grown to 4,000 employees. IBM introduced the first commercial electric typewriter in 1935, and by 1937 the company boasted 10,000 employees and a gross income exceeding \$30 million annually.

From the beginning, Tom Watson stressed research and development, and concentrated his company's energies on producing equipment for large corporate and government customers. As early as 1920, IBM began configuring custom-designed systems for powerful corporate clients, and began to develop leasing policies

that were tailor-made to each individual customer's needs. Typically, an efficient IBM technician installed the leased IBM equipment. He was accompanied by a well-versed IBM service representative who was subsequently on call to that customer in the event the equipment malfunctioned or the customer developed a problem. In this manner, IBM developed a reputation for customer support service and began to nurture a loyal corporate customer base. As Tom Watson, Jr. noted in 1963, "In a company like ours, a reputation for service is one of our principal assets."

By the mid-1930s, IBM had captured over 80 percent of the market for punched card manufacturing from its sole competitor, the Remington Rand Company.

With the advent of World War II, IBM offered the government the use of its production facilities and factories, accepting a 1½ percent profit margin on war materials it produced. Wartime products included aircraft gun control instruments, Browning automatic rifles, bomb sights, and 30-caliber carbines. In addition, thousands of IBM accounting machines handled paperwork in Washington and on the front where they followed troops into battle in mobile units.

IBM emerged from the war into a world that had changed radically. Between 1918 and 1938, data processing technology had remained essentially static. It was based on the electronically-sensed punched card. IBM faced the postwar technological revolution with 80,000 employees, 19,000 customers, and an annual growth rate of 24 percent.

The Computer-Cautious Colossus

The period between the end of World War II and the outbreak of the Korean War in 1950 was turbulent and unsettled. Wat-

son, Sr. was 71 years old in 1945 and on the eve of retirement. His primary interest lay in protecting the empire he had built. He was not prepared to anticipate, or even to recognize the implications of the massive

WATSON, JR., newly returned from combat, burned to begin exploring the new technologies.

social and technological changes that were sweeping postwar America. IBM over the next 4 years would face its most bitter battle to date, an internal struggle that would envelop the entire company and alter its trajectory forever. Within the company, two classically opposed factions began to take sides. Watson and the majority of the company's highly-placed executives were determined to hold a conservative line and protect existing interests. Watson, Jr., newly returned from wartime combat, and a handful of IBM engineers burned to begin exploring the new technologies that surrounded them.

During the mid-1930s, IBM had donated research funds and equipment to Columbia University's Astronomy Computing Bureau, where scientists attempted to adapt office tabulators and accounting devices to calculate advanced astronomy equations. Universities across the nation, notably Columbia, Harvard, the University of Pennsylvania, and Princeton began experimenting with primitive computers. IBM, Remington Rand, the Burroughs

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This month we are offering (3) three outstanding peripheral products. The first area is memory. The IBM PC DOS can recognize 640K of add-in memory. The VISTA "maxicard", through multilayer technology, adds 576K which if added to your existing 64K maximizes the memory in one slot. The 576K card is supplied at no additional charge with Dynadisk™ software to emulate a disk drive which allows you take advantage of the fast access times that RAM disk provides. For extended worksheet capabilities you can use "SUPERCALC™" supplied with the card at no extra charge when the fully populated card is purchased at ACP.

The second card featured this month also comes from VISTA. The popular "PC Master" represents the highest level of multi-function I/O available on one card for the PC at any price. The "PC Master" features (2) two RS-232 serial ports which the primary serial port is configurable as DTE or DCE. It has a parallel printer port (IBM compatible), game joystick port, real time clock/calendar with auto recharge, Vortrax speech synthesis, 2 watt audio amplifier, and a Xebec/Seagate compatible hard disk host adapter (SASI compatible). All of this is on one card and is software supported with the exception of the host adaptor which will be released in the 1st Quarter of 1983.

Finally, we believe that the TEAC half-high (thinline) double sided floppy disk drives are a better option than TANDON. Two TEAC drives will fit into one disk opening in your PC which will allow you to add a hard disk in the other opening at a later date.

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3. TEAC Half-High Double-Sided Drives (320K)	399	\$299

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P/N MG-064SP, add'l Ser. Par	695	499
P/N MG-256, 256K, Ser. Clik	995	695
P/N MG-256SP, add'l Ser. Par	1095	749
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P/N IO-SP, Clik, (2) Ser. Par	285	199
AST Combo Plus™ Card		
P/N MC256SPC 256K, clik, P/S	995	895
AST PC Disk++™ Card		
P/N MD-064, 64K, Host, Par	655	495
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200 Baud Direct Modem	349	299
COEX		
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DAVONG		
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ASHTON-TATE		
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dBase II for PC-DOS 128K	700	445
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Versaform	390	259
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CONTEXT MBA	695	529
DATAMOST		
Real Estate Investment	130	89
Write-on IBM	130	89
DENVER SOFTWARE		
Executive Advt Sys (easy)	725	555
EAGLE SOFTWARE		
Money Decisions	150	130
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Corporation, NCR, and General Electric offered modest grants to individuals and research teams at these institutions. Although Watson had spent \$500 thousand in 1940 to fund development of the first large-scale computer, the Mark I (it was subsequently donated to Harvard), he still had grave misgivings. He viewed the Mark I as merely "an interesting experiment," too unwieldy, exotic, and expensive to replace calculators and adding machines in the nation's offices.

At this juncture, two researchers, physicist John Mauchly and electrical engineer J. Prespert Eckert, were working fe-

verishly at the University of Pennsylvania's Moore School of Economics to develop the first real computer, a vacuum-tube device that could rapidly compute ballistics curve calculations. The machine was called ENIAC, an acronym for Electric Numeric Integrator and Calculator.

Paralleling ENIAC's development, IBM designed the selective sequence electronic calculator (SSEC), another primitive computer. Watson thought the machine prohibitively expensive, a "giant brain" of interest only to the scientific community. He resisted long-range planning for the development of computers,

feeling that they were merely a curiosity riding a postwar wave of public interest, a wave that would soon break, scattering its proponents. Stubbornly holding his ground, Watson introduced a line of faster electronic calculators, the 600 series.

External events began to propel IBM toward change, however. Unlike IBM,

**UNLIKE IBM,
other companies had
not ignored the
interest in and
potential of
computers.**

other companies had not ignored the interest in and potential of computers. RCA had begun negotiations with computer theoretician John Von Neumann. These negotiations eventually led to production of the Electronic Discreet Variable Automatic Computer (EDVAC). In 1950 Remington Rand purchased an ENIAC offspring, the Universal Automated Computer (UNIVAC), from a university research team and integrated it into the Census Bureau where it immediately replaced a substantial portion of IBM's existing product line. Finally stung, IBM was forced to respond; the corporation realized that it had made a series of errors by reacting too late.

The next years were critical as IBM attempted to catch up with the dawning computer age. IBM had several weapons in its arsenal, however, including a stellar sales force, enough cash to fund innovative engineering and research, and the foresight of Tom Watson, Jr., the company's new CEO. During the years that followed, Tom Watson, Jr. sought to make up for lost time and correct IBM's drift to complacency.

"Those who cannot remember the past are condemned to repeat it," said Harvard scholar George Santayana. IBM, it seems, remembers well. /PC

Kathleen Burton, a technical writer and free-lance journalist, lives in Oakland, California.

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- It is understood that memory is one of the most important elements of a high performance computer. The management of this memory in an efficient manner is crucial to multi-tasking. A typical snapshot of memory in use shows gaps of unused memory both inside and outside of a program's space. The larger the number of tasks, the more compounded the effect. Operating systems using FMPM's memory management minimizes these gaps. Rather than shuffling data and programs during 'housekeeping time', FMPM simply manipulates the contents of memory mapping registers located in extremely high speed memory. This is the way the big computers do it — LIGHTNING FAST!
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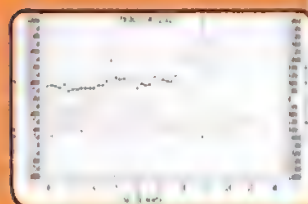
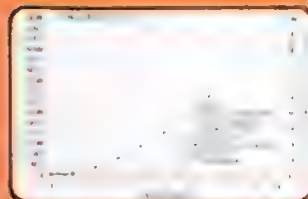
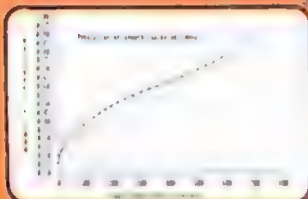
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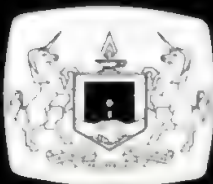
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One of America's largest corporations offers to buy PCs for 1,100 executives; it buys the know-how from National Training Systems, Inc.

Reaching For The Top

United Technologies Corporation (UTC), headquartered in Hartford, Connecticut, is one of the largest industrial concerns in the world. UTC Power Industry builds Pratt and Whitney jet engines. Its Building Systems Division is responsible for Otis elevators and Carrier air conditioners. Another division manufactures Sikorsky helicopters. Given the tenuous position of American technology on so many fronts, it's reassuring to learn that one of the corporation's divisions devotes itself entirely to old-fashioned R&D, research and development.

UTC is at the vanguard of applied technology in every province of its diversified realm. But when UTC's top managers got together to look over their broad turf, they noticed something amiss. Executives throughout the corporation appeared to be slightly out of step with advances in one

al teachers and perhaps even students and parents to a computer camp, a workshop, or a computer literacy lab designed for potential users. Once UTC opted to buy IBM PCs, the question became, "Where does a diversified industrial and technological giant find computer training for up to 1,100 senior executives?"

Start from Scratch

United Technologies turned to National Training Systems, Inc., (NTS) of Santa Monica, California. NTS specializes in developing customized and what it calls generic, or off-the-shelf, training programs and materials based on instructional technology, a discipline that mixes educational theory with psychology and hard-nosed pragmatism.

Since it was founded in 1974 by Ron Posner, a Harvard Business School graduate, and Jay Sedick, an expert in training development, NTS has emphasized sales and computer user training. It has been involved in over 50 projects for IBM, including a study to determine how executives use the PC. The compound subject of executives and computers wasn't completely foreign to NTS, but it soon realized that the assignment from UTC required breaking new ground.

The first step was to find out what others in the field were doing. It didn't take long. The few companies or individuals engaged in executive training were either too small to attract notice or relied on unsophisticated, untested training methods. The researchers at NTS realized that they knew more than anyone else doing the same thing.

After discovering that it would have to invent an executive computer course from scratch, NTS composed detailed questionnaires and distributed them to the intend-

ed users at UTC. The execs were generally cooperative. Most of those who responded indicated that they were eager to learn everything they could about the IBM PC rather than one or two specialized appli-

***THE EXECS
were interested in
learning applications
that would gain
a competitive edge
for their company.***

***EXECUTIVES
lacked access to
a device that had
already found its
way into homes,
classrooms, offices,
and small businesses.***

major area of technology. They lacked access to a device that had already found its way into homes, classrooms, offices, and small businesses across the land. They lacked personal computers.

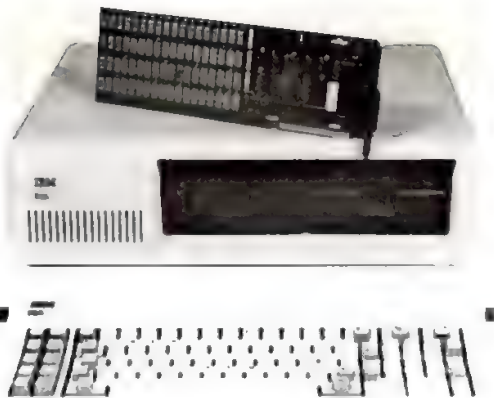
When a school district buys personal computers, chances are that it sends sever-

cations. Further, they indicated a preference for working directly with the machines as much as possible during the training sessions. Like good managers, they let it be known that they were especially interested in learning applications that would enhance productivity or otherwise help gain a competitive edge for their company.

What emerged from the extended research phase of the project was the Executive Computing Workshop, a 3-day, off-site course heavily weighted in favor of hands-on experience. In fact, participants spent only 20 percent of the time in traditional lectures and demonstrations. The workshop also includes a clever, entertaining, and very effective management simulation in which the executives become movie producers for a day. The simulation serves as a model for typical executive computer applications and reinforces the skills the execs learn during the first half of the workshop.

The NTS workshop is designed to ac-

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comply three basic goals: to increase personal productivity, to help execs become proficient enough to manage others who use PCs, and to make them aware of technological resources to help keep their company on the leading edge of innovation.

The workshops can accommodate between 12 and 16 participants, who are each assigned an IBM PC configured with 256K memory, an MX-80 Epson printer, a BMC color/graphics monitor, a color/graphics board, and a modem. After carefully comparing the management needs and responsibilities of the executives with the available software, UTC opted for MBA, an integrated managerial program designed specifically for the PC. Manufactured by Context Management Systems, MBA combines four applications in one program: spreadsheets, word processing, graphics, and electronic storage and retrieval. One appeal of integrated software is that it doesn't require changing disks when switching from one application to another. To round out the computer

ONE APPEAL
*of integrated software
is that it doesn't
require changing
disks when switching
from one application
to another.*

capabilities covered at the Executive Computer Workshop, NTS scheduled time to introduce electronic communications, including Dialcom and the Dow Jones News/Retrieval service.

Don't Ring the Alarm Bell

The instructional technologists at NTS designed the Executive Computer Workshop to be a nonthreatening experience. They understood that corporate executives, like anyone else, may feel intimidated by computers. Independent management research had already established that one out of ten executives is actually

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afraid of computers, fearing that he or she won't be able to adapt to the new technology. Computer anxiety is, of course, counterproductive. It not only makes implementation more difficult when the time

ONE OUT OF ten executives is actually afraid of computers.

comes (if it comes), but reduces the apprehensive manager's effectiveness.

Until the day arrives when executives can no longer avoid using computers, their reactions will be difficult to predict. For this reason, NTS stressed a balanced approach to the workshop. Preliminary materials are written in simple, neutral language. The precourse handbook, *Executive Briefing Booklet*, makes no extravagant promises and contains several caveats and disclaimers. It includes a description of course objectives, an agenda, a Personal Computer Plan Checklist, and reprinted articles, some examples of which are "How Personal Computers Can Backfire," "How to Conquer Fear of Computers," and "The Fortune 500 Microcomputers."

The Personal Computer Plan Checklist has headings that match the four computer applications emphasized at the workshop. It is written in clear, nontechnical language. Avoiding potentially threatening jargon, it calls one category "working with numbers" instead of "electronic spreadsheets." The other jargon-free applications titles are "working with words," "working with graphs," and "communications." The workshop materials, like the workshop itself, are designed to be user-friendly but not misleadingly friendly.

Under each heading the Personal Computer Plan lists detailed responsibilities. It asks participants to indicate what percentage of working time they spend on each task and whether these tasks could be done on the computer. The executives complete the checklist before the workshop begins. During the third day of the program, they review their Personal Com-

puter Plans in light of new skills. The exercise is intended to encourage execs to go back to their offices and start using their PCs immediately. It connects the training material to office routines and suggests which applications will prove most useful in the day-to-day business of running the corporation.

The first day of the workshop emphasizes MBA applications. It begins with a discussion of microcomputing in general and the IBM PC in particular and concludes with questions and answers. The workshop is led by two NTS instructors, one a technical expert and the other a PC-proficient executive who engages the participants as a peer. The instructors transmit their master screen to each user's PC so participants can see how to proceed through each application. During the guided self-study segments of the workshop, both instructors serve as roving coaches, offering assistance to perplexed novices.

Day 2 of the workshop continues with MBA applications and introduces electronic communications. Before lunch, participants spend 1½ hours learning how to keep things running (DOS, Backup, etc.). The fun begins after lunch.

Lights! Camera! Action!

NTS devotes the entire afternoon of the second day to a management simulation exercise. The instructors divide the execs into teams of three movie production executives. Each team is assigned two PCs, one for communications and the other for using as a multifunction work station. The movie moguls plunge into a compressed production schedule that requires executive-level decision making and incorporates all the computer applications they've learned. The instructors, sitting at their master console, regulate the simulation, creating a unique scenario for each team. The teams do not compete against each other, but their performances are evaluated later.

The participants begin the simulation by reviewing new movie concepts for their studios and engaging the electronic communications capabilities of the PC. They use word processing to write proposals and counterproposals, and spreadsheets and graphics to develop and adjust budgets. Teams must make quick, complex projections based on available data.

The simulation is as realistic as possi-

ble. While NTS cannot hire Sylvester Stallone or Diane Keaton to appear at the workshops, it has created the illusion that they and other familiar actors and actresses (or their agents and lawyers) are at the other end of the line trying to wring out the best deal. Participants discuss rates, options, percentages, and other variables with the imaginary stars and studios through their PCs. They move from proposal to production, and from postproduction to distribution. Though the context of movies may be unfamiliar, the language and procedures of producing a movie are similar to the management procedures of any corporation, large or small.

When they have finished, each team receives a "film review" that sums up and critiques their exhilarating half day as vicarious movie makers. The simulation pushes the execs out of the nest. They learn to fly the PC solo by using what

**WHILE NTS
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the best deal.**

they've learned in the workshop to achieve a management goal—just as they do when they return to their jobs at UTC.

"Advanced Individual Practice" dominates day 3 of the workshop. Coaches are available to answer questions and give advice. Part of the day is spent evaluating the workshop and brainstorming. Executives are encouraged to participate in shaping their own technological futures; that is, to learn how to anticipate changes that can keep them and their corporation ahead of the game.

NTS emphasizes that the Executive Computing Workshop is generic. It can be

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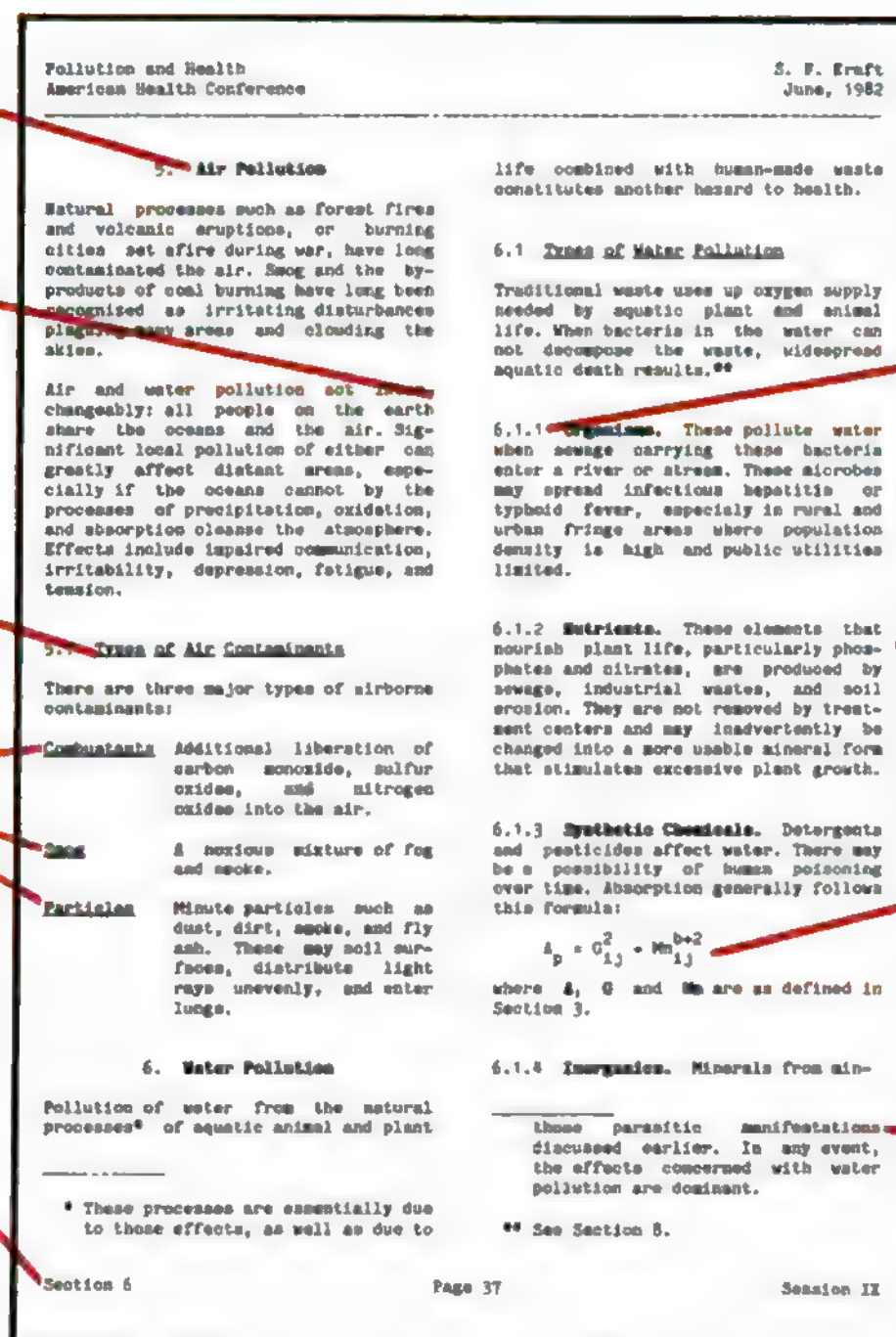
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adapted to any corporation or institution that requires training on IBM PCs for upper- or middle-level management. Additionally, NTS has begun devising completely self-guided, less comprehensive

EACH TEAM receives a "film review" that sums up and critiques its exhilarating half day as vicarious movie makers so they can use what they've learned.

versions that can be implemented at the work site.

UTC isn't the first Fortune 500 company to discover personal computers. AT&T, John Hancock, JC Penney, McGraw-Hill, and Polaroid, among others, use micros routinely, though in most cases without a coherent master plan. One department may use a TRS-80 Model II while down the hall another relies on an Atari 800. Using different computers inevitably leads to problems with system compatibility.

UTC may be the first corporate giant to embrace microcomputer technology on a corporatewide scale. Its decision to buy IBM PCs reflects its confidence that they will assure both system compatibility and the flexibility required to adapt to the diverse executive demands of independent divisions.

NTS, by seizing the moment, has literally and figuratively written the book on executive computer training. If UTC's commitment to a personal computer in every executive suite turns out to be good business, no corporation will be able to afford to be without it. /PC

For more information about the NTS Executive Computing Workshop, contact Karen Orton, National Training Systems, Inc., 1111 Broadway, Santa Monica, CA 90401, (213) 394-7685.

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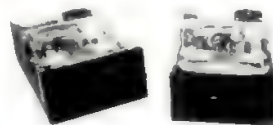
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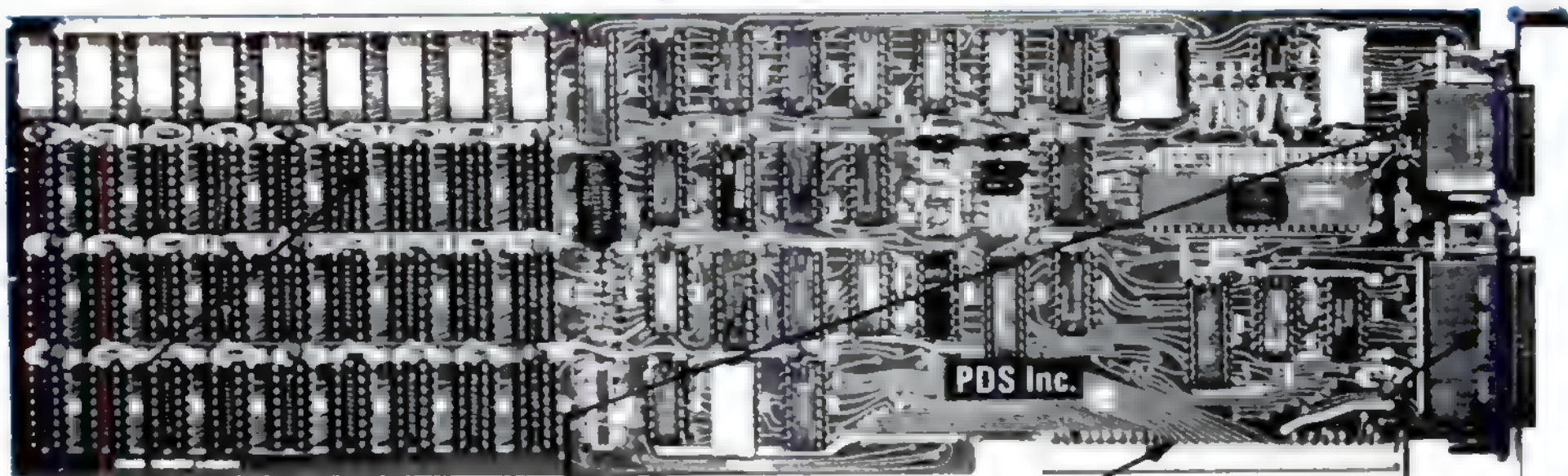


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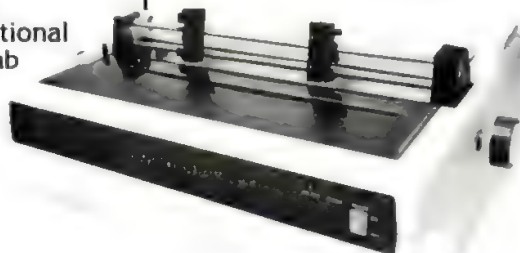
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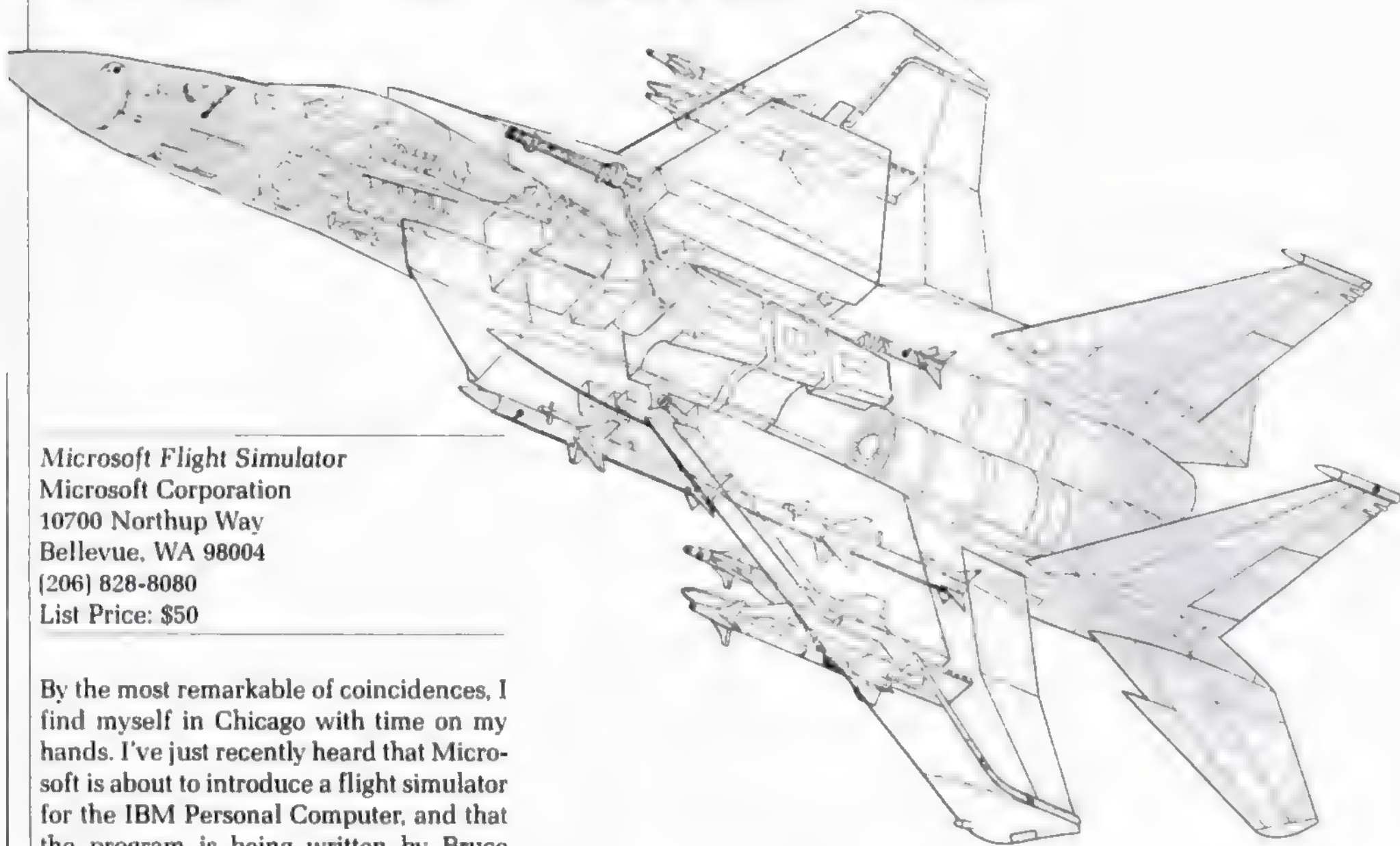


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By the most remarkable of coincidences, I find myself in Chicago with time on my hands. I've just recently heard that Microsoft is about to introduce a flight simulator for the IBM Personal Computer, and that the program is being written by Bruce Artwick. What luck! I'm only a short hop

AT ABOUT
4,800 feet I throttle
back to 65 percent and
begin to level off.

from Champaign, the home of Bruce and his company, Sublogic.

My luck holds. It is a beautiful day for flying, and friends offer to loan me their plane. It's gassed and waiting at Meigs

Field, they tell me. Sure enough, I find it without difficulty.

Of course, the fact that the aircraft is sitting in the middle of the runway with the engine running strikes me as a little peculiar, but I climb merrily into the cockpit and begin my checkout. Let's see, fuel tanks full. Radios on and working. Engine sounds smooth, temperature and pressure coming up. Visual check out all windows: okay. Control surfaces working properly.

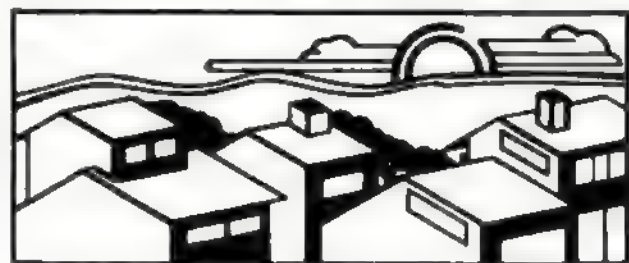
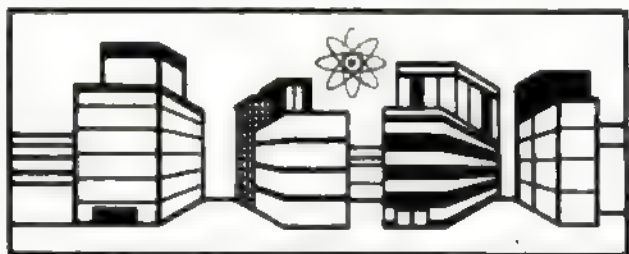
The plane is sitting on the runway facing north, but I'm a little too close to the northern end for comfort. I like a lot of runway. There's nothing going on around me, and no visible traffic, so I apply a little throttle and turn hard to the left. I'm off, a

slow taxi to the southern end of the runway.

The radios are set for Willard Airport, but I decide to cruise at 5,000 feet, which puts the VHF omni-directional radio (VOR) at Willard out of range. So I reset the navigation (NAV) radio to 113.2 megahertz (MHz), the Peotone VOR. I also tune the communications (COM) radio to 123.0 MHz, the frequency of the Greater Kankakee Airport control tower. If my navigation is any good, I'll pass just to the west of this airport after I fly over the Peotone VOR. With the frequency set, I immediately hear a report which, except for weather conditions, I ignore.

Ah. I'm at the southern end of the run-

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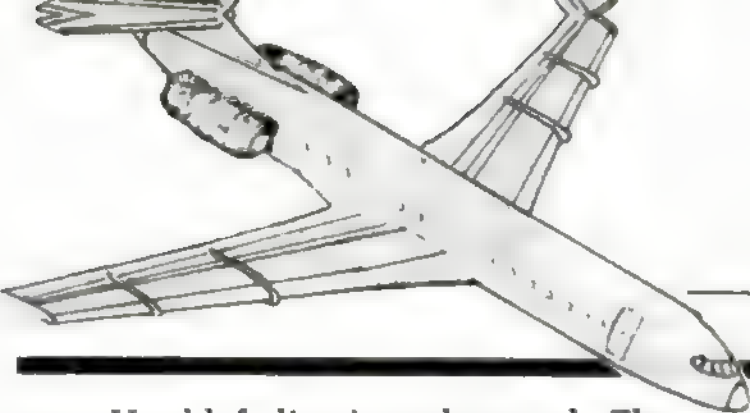
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CIRCLE 196 ON READER SERVICE CARD



way. Hard left, line it up due north. Flaps up, full throttle, and I begin the roll. Oops, due north isn't quite right; nudge it a little west, that's good. Now the speed's picking up, looks good, airspeed about 70, plenty for takeoff. Ease back the stick, hold it for a second, and I'm off!

The View From Here

Landing gear up. That's funny, I still see a wheel under my left window when I look down. Hmmm. I put the stick forward just a tad and the plane picks up speed. At full throttle, I begin a rapid climb. I sneak a quick glance over my shoulder to watch Meigs slip away, and I take an extra moment to take a snapshot. The John Hancock building looms up to my left, and I begin a left turn to head south.

Golly, that's a neat building from the air. I decide to fly around it for a full view. I bank right toward the eastern side of the building; then I bank left to head around it counterclockwise. Ah! Perfect view, another snapshot. Is that somebody in the building waving at me? Hard to tell. Just my imagination, I guess.

Enough foolishness. I hold the left bank. I'm at about 2,000 feet and climbing now. I flip the omni-bearing indicator (OBI) until I find a course toward Peotone. There it is; I head southwest, course 190. Off to my right is the Sears Tower, and Chicago-Midway is coming into sight. That's about the last landmark I know in Chicago, so I concentrate on getting the aircraft into a stable configuration.

As I pass through 3,000 feet, I ease back the throttle to about 75 percent and return the stick to almost center, just a little back. I'll keep climbing, just a little slower. I pick up a little forward speed. A glance at the

OBI and my compass confirms that I'm on course.

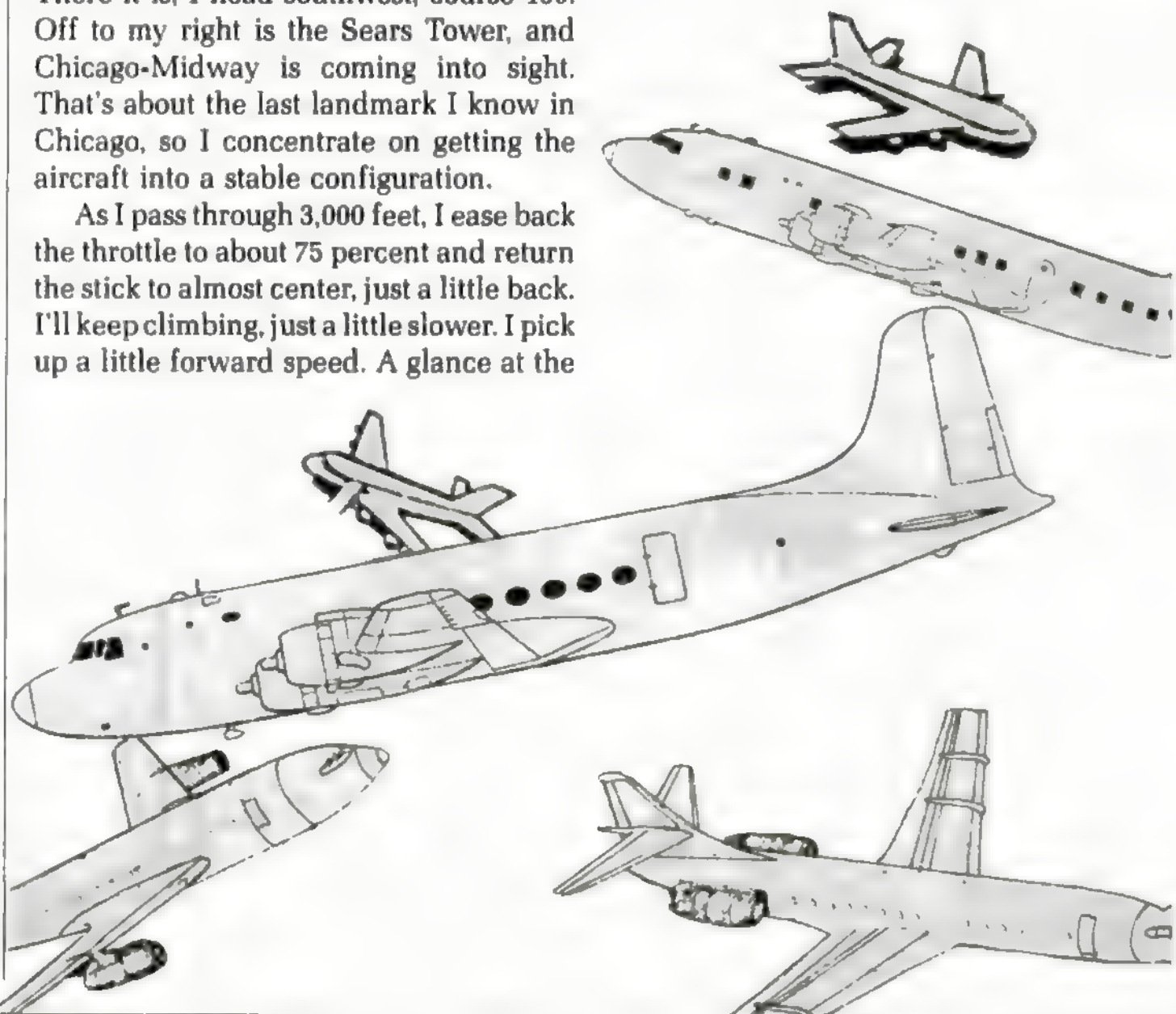
At about 4,800 feet I throttle back to 65 percent and begin to level off. I continue to climb about another 100 feet, and then I level. That looks okay, so I begin to get ready for my first course change.

I pull out my chart. I decide to fly from Peotone to the Roberts VOR, then maintain that course until I intercept the 170 bearing from the Champaign VORTAC. I'll then turn left and I should find myself heading directly for the Willard runway.

Aha. The OBI changes from To to From, indicating that I've just passed over the Peotone VOR. NAV frequency to 116.8, Roberts. Spin the OBI, looks like 210 will do it. I gently bank to the right until I'm heading that way. There's greater Kankakee in the distance, just a little to my left. That's really the last landmark I can identify before I get to Champaign.

The aircraft is doing well. Plenty of fuel, although somewhat less than I expected. Let's see, the plane's range is supposed to be 7.5 hours at 65 percent throttle, but I climbed under full power for a while. Still, both tanks register half full after only 30 minutes of flying. Maybe I've got a leak. I hope I make it.

The OBI flips from To to From, and I



know I've just crossed Roberts. NAV goes to 110.0, and I begin to watch the OBI for bearing 170. Shouldn't be too long—there it is! I turn left to heading 170.

Down To Earth

Now I begin a gradual descent by throttling back to about 25 percent. The plane drops very slowly. Willard is not in sight yet. Check the chart. Willard altitude is 754. There it is! Altitude is now 3,000 and I continue my glide. The airport is getting closer now, but I'm too high. I inch the stick forward, and I drop a little faster. Two thousand feet now, so I give 10 percent flaps and inch the throttle back up to 50 percent. Stick forward to keep the glidepath. I've got a better view of the airport now, but I'm not lined up for the run-

BOTH MY tanks have been hit from behind. Curse you, Red Baron!

way as I had planned. I begin to adjust my course to line up. Fifteen hundred feet, landing gear down. A little carburetor heat, just in case. Sixty-five percent throttle, 20 percent flaps. The runway is in front of me, but I need further adjustment to line up. One thousand feet, about 80 knots, looks good. Oops, I'm over the runway at 1,000 feet, or 246 feet above ground level. I inch the stick forward to drop a bit faster. There we go, 900, 800. Full flaps. Ease the stick back. What's this? The stall warning blares. Back off the stick a tad. I'm not stalling, but I'm not going down! Stick forward; that's better. I sink, cut the throttle, ease back the stick, and hear the wheels hit the ground. I'm down!

Hold it now. Stay on the runway; look for the taxiway. Apply some brakes. There it is. Off the runway. More brakes. Oh, heck, stomp on the brakes. The plane stops.

And I stop to catch a breath.

Okay, I'm here. I start to look for Bruce Artwick. He must be around here somewhere. I taxi all around the airport, but no luck. No other planes in sight. You mean I flew all this way and he's not around? I'm

crushed.

Change of Scenery

I sure don't feel like flying back to Chicago, but I guess I don't have any choice. Here we go. Visual check ok. Radios ok. Fuel tanks topped off. Huh? How'd that happen? Wait a minute, where am I? This doesn't look like Willard. Hold it. The instruments are different. And those indicators. Ammo? Bombs? Hey, what gives?

Hmmm. Big river ahead. Is that an airport in the distance? Funny, the ground looks like graph paper. Wait! What's that ahead? Looks like some other aircraft. Can't make them out, though, they're too far away. I think I'll land at that airport and see if I can find someone to tell me where I am.

That's funny, those are biplanes. Wait a minute! They're Fokkers! I click off a picture in case somebody doesn't believe me. Holy smokes, they're shooting at me! I fire back. I'm a bad shot, and I miss. There's one, right in my sights! I fire! A hit! Uh oh. My fuel gauges are dropping, and fast. Both my tanks have been hit from behind. Curse you, Red Baron!

I'm at 2,000 feet, and I look frantically for a place to land. I'm only a couple of miles from friendly territory—maybe I can make it. I start to turn toward home. I'm hit again! I begin to bank hard to the left. I yank the stick to the right, but I'm out of control. I'm spinning! Calmly, I salute the victor. I'm going down fast! Arrgh. . . .

Now For A Snack

It's been an exhausting 2 hours. I get up, stretch, and head for the kitchen for a snack. Let's see, Coke, munchies, and back downstairs. Get my notes, and reboot the computer.

That's right. For the last 2 hours the Microsoft Flight Simulator has let me fly from Chicago to Champaign and let me do battle with six German fighters of World War I vintage. And that's only a preview of the capabilities of the program.

Written by Bruce Artwick, the program is described by Microsoft as "a second generation, real-time flight" simulator for the IBM PC. It requires a 64K system with a disk drive and a color/graphics adapter (with any kind of display device). The program provides an extraordinarily realistic simulation of the flight of a single-engine light aircraft.

The product is visually exciting. Half the screen is devoted to a detailed rendition of an aircraft instrument panel. The standardized instruments (airspeed indicator, artificial horizon, altimeter, turn and bank indicator with 2-minute turn marks, gyrocompass, and rate of climb indicator) are included in a cluster on the left side. An omni-bearing indicator (OBI) and an engine RPM gauge are in the approximate center. On the right is the radio stack with COM and NAV radios and a transponder. A digital clock, magnetic compass, ILS marker indicators, fuel gauges, and oil temperature and pressure gauges are provided. Indicators for the instrument panel lights, carburetor heat, magnetos, and landing gear are at the far right. Scattered around the panel are indicators for flaps, elevators, elevator trim, rudder, ailerons, and throttle.

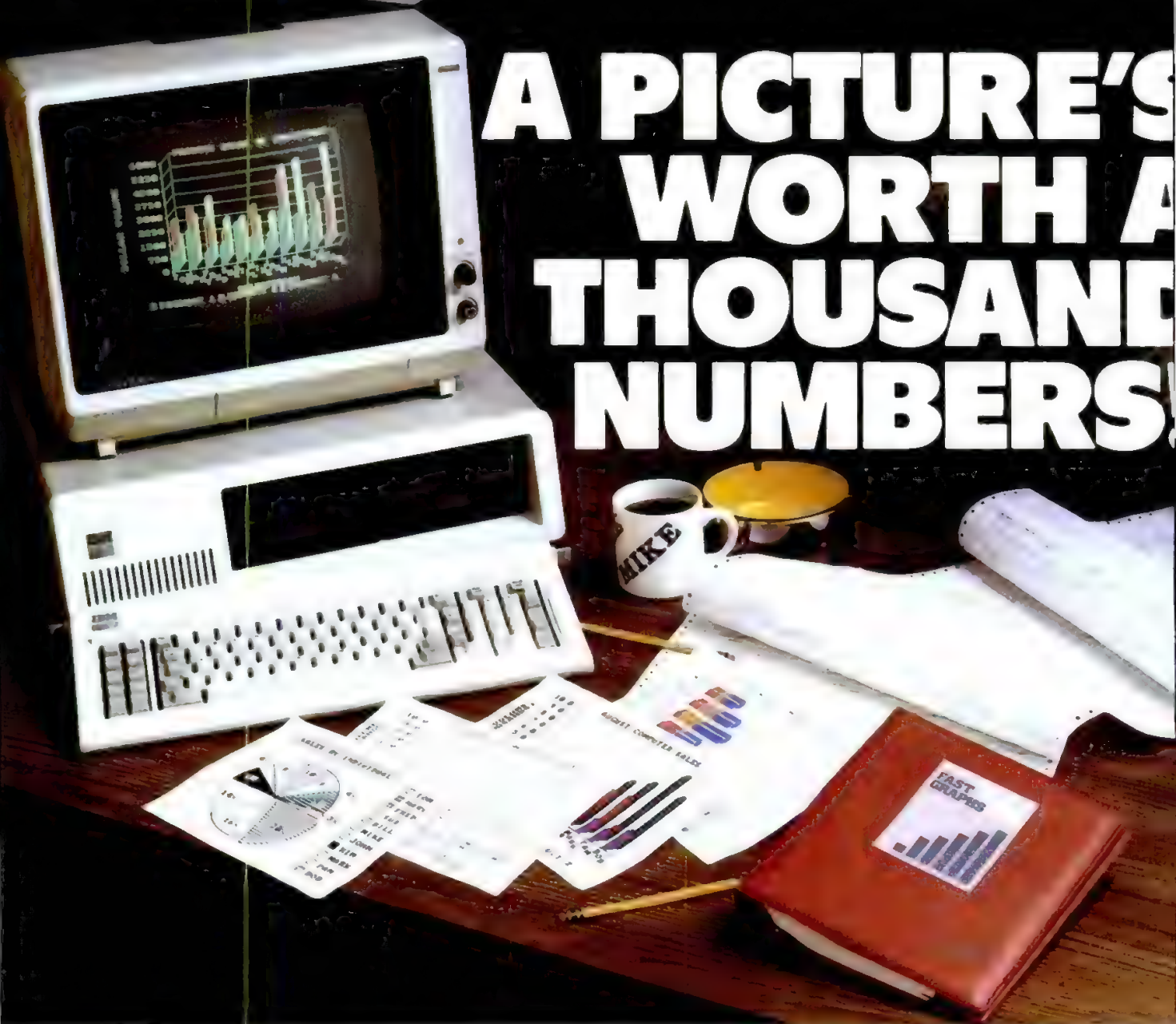
The window display is stunning. The pilot has a 360-degree field of view through eight "windows." The pilot can also look out the window (left side of aircraft) for a downward view. The display is in color. The ground is green, water blue, sky light blue, and clouds white and gray. Airports are white outlines on green. When the aircraft is moving, the animation is fantastic. Microsoft claims 15 frames per second which is, of course, the same speed as home movies and half the speed of video tape. The motion of the "world" and the objects in it is very smooth.

The world is very big. It is a square 10,000 miles on a side. The data base used

WHEN THE aircraft is moving, the animation is fantastic.

to represent the world has a resolution of 2.5 inches; that is, the distance from a coordinate in the system to one of its immediate neighbors is 2.5 inches. North America fits easily into the data base.

After the terrific display graphics, the next best feature, but the most important for the product, is the contents of the data base. Five major areas of the United States are included with the product: Seattle (near the home of Microsoft), Los Angeles



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(including Catalina), Chicago (extending far enough south to include Champaign, home of the program author), Boston, and New York. Altogether, there are about 22 airports and 38 VORs. Recognizable landmarks, such as the Sears Tower and Hancock Building in Chicago, are included in each area. Everything is in its place; the "world" is geographically correct.

The Parameter List

These cities are too far apart to fly between, although New York to Boston can be managed. Since the simulator always comes up with the aircraft at Meigs, an editing mode is provided to let you change a long list of parameters, including your position. It is easy to move from Boston to Los Angeles in just a few seconds.

But these parameters do much more. The first one on the list is called the mode. There are 50 modes, with 0 through 9 preset with the program and the rest available for modification by the user. Selecting modes 0 through 9 causes the rest of the parameters (or at least those needed) to be automatically set. The other 40 modes are empty, and can be written with any settings desired.

The parameter list includes settings for two layers of clouds and three layers of winds. If these settings are ignored, the day will be clear and without wind. The

A POSSIBILITY exists that the aircraft could develop some kind of trouble during the flight.

time can be set, for day, dusk, or night flight. The season of the year can be selected, which affects the time of daybreak and nightfall.

The state of the aircraft is completely represented by a set of parameters in the list. Pitch, heading, altitude, airspeed, throttle position, rudder position, and elevator position can all be set by entering the appropriate values.

The last item on the parameter list is the reliability factor. If this factor is re-

duced from 100, then a possibility exists that the aircraft could develop some kind of trouble during the flight.

The default mode is 0, called "Easy Flight." It has some characteristics that make flying easier and are especially designed with the novice in mind. One feature is called *autocoordination*. When it is engaged, the ailerons and the rudder move together, and the aircraft is easy to steer. Another feature, *reality mode*, keeps the engine running all the time, causes empty fuel tanks to be ignored (you can still fly), prevents the heading indicator from drifting, and keeps the instruments visible, even at night with the lights off. When reality mode is on, these factors and others contribute to increased complexity in the simulator.

The ten preset modes provide a number of flying situations. There is one mode for fair, moderate, and bad weather flight. Dusk and night flight each have a preset mode. Two modes are dedicated to airborne situations, one normal and one emergency. The "British Ace" game is started by selecting mode 7.

The only part of the simulation that is not particularly realistic is the way in which the controls are implemented. Of course, there is no control yoke. All controls are on the keyboard. Once known, however, they are not difficult to use. The stick takes some practice; there is a tendency at first to think of the "up" and "down" cursor keys to mean just that, when in fact they mean "stick forward," which makes the aircraft nose down, and "stick back," which makes the aircraft nose up. If autocoordination is removed, the rudder must also be controlled.

The odd-numbered function keys on the left of the keyboard are used for flaps and the even-numbered keys for throttle. The letter keys are used for just about everything else. The landing gear switch is G, magnetos M, carburetor heat H, etc. The three radios can be set with C for COM, N for NAV, and T for transponder. The OBI is set with V for VOR. D resets the gyrocompass, and A sets the altimeter for the current barometric pressure. In "British Ace," X drops a bomb, W declares war, and the space bar fires the machine guns.

Some runways at some airports have an Instrument Landing System (ILS) beacon. However, the version of the program I was testing did not have this feature.

When the program is complete, ILS will allow very accurate positioning.

This all sounds very complicated, and it is. The manual that comes with the simu-

THE TEN **preset modes provide** **a number of flying** **situations.**

lator is over 100 pages long and includes aeronautical charts (accurate, but for use with the simulator only), an excellent glossary of terms, good diagrams, and a big section on how to fly. I felt one thing was missing; although area charts were provided, I thought that the more detailed airport approach charts or airport diagrams would have been useful to indicate runway headings. Since the world in the simulator is accurate, it should be possible to buy commercially available charts for this purpose. With that exception, the manual is excellent.

And even though the program is complicated, it can be enjoyed almost immediately. As you grow more proficient, you'll be able to handle greater and greater complexity. The program lets you dole out the complexity in dribs and drabs, at your pace.

Total Flight

It's not hard to summarize my feelings about this program. True to its tradition, Microsoft has again chosen to offer a classic program, unique in the market. The program is extensive, and the aircraft simulation is realistic. The graphics are outstanding. "British Ace" alone is a considerable advancement over Artwick's previous effort, the Sublogic *Flight Simulator* for the Apple and TRS-80 (still good sellers, by the way). In short, it's a great program—one everybody is going to want. In fact, I think it's going to sell its share of IBM PCs, and will certainly sell some color/graphics adapters. /PC

This is Will Fastie's first article for PC magazine. He is a contributing editor for Creative Computing magazine where his "IBM Images" column appears regularly.

Computers that can recognize and synthesize speech are appearing as educational tools in the marketplace and as teaching mechanisms for handicapped students.

In The Beginning The Word

Type-'N-Talk
Votrax
500 Stephenson Hwy.
Troy, MI 48064
(800) 521-1350
(313) 588-0341 in Michigan
List Price: \$375

It used to be that the talking computer was only a figment of the science fiction writer's imagination. While the computer could speak in movies, it hadn't yet found its voice in the real world. Well, the computer has come a long way since then, and ComputerSpeak is a rising crescendo in our daily lives. Call a telephone number that has been changed and a computer will give you the new listing. Autos tell us when to fasten our seat belts and the elevator announces the floor in a digital voice. There's even a talking Coke machine now. And with a number of low-cost devices on the market the PC user can also experiment with voice output.

ComputerSpeak is a one-way conversation, limited by voice recognition technology. In other words, while intelligible speech can be synthesized, machine recognition of normally spoken words in a noisy room is still beyond the state of the art. Voice recognition has, however, progressed to the point where the computer can identify isolated words spoken under ideal conditions. And with the current developments in speech synthesis, some form of voice output will probably be standard on future computers and terminals.

Speech synthesis is being used mainly in education and for aiding the handicapped. IBM is conducting a pilot study of voice output as a teaching aid for reading and arithmetic. The company has installed 300 PCs equipped with record-playback boards in elementary schools in five states and the District of Columbia area to be tested by 10,000 students. When used to teach reading, for example, the computer displays a picture on the screen along with the word describing the picture and then pronounces the word.

The computer teaches spelling by pronouncing a word and asking the student to type it. If the student makes a mistake, the

MACHINE
*recognition of
normally spoken
words in a noisy room
is still beyond the
state of the art.*

computer spells the word and takes the student through the exercise again. IBM is supplying software, student workbooks, teacher manuals, and training for teachers along with the computers and voice I/O boards.

Speech synthesis devices are improving the quality of life for the handicapped.

The Desktop KRM (Kurzweil reading machine), for example, scans text and reads it aloud for the blind. While the sound quality of such devices has been improving, their costs have fallen significantly. The Desktop KRM has dropped in price from \$70,000 to \$30,000. This year Xerox Corp., Kurzweil's parent company, donated KRMs to 200 colleges and universities under a \$6 million grant program.

Bill Shea, a reading and math teacher at the Plumbrook Elementary School in Sterling Heights, Michigan, started using a Type-'N-Talk voice-synthesis system on a PC as a teaching aid and then adapted the system to aid handicapped students. Shea, who's been experimenting with PCs since they first appeared on the market, says that while he was applying the talking computers to a variety of educational uses, he saw the opportunity to help some of the county's handicapped children who were being bussed to special classes at his school.

"We first tried it with a 7-year-old boy who had cerebral palsy so bad that he could only nod his head," Shea says. "The only way he could communicate was to make simple gestures and point his eyes."

Shea rigged a pointer that could tap out letters by movements of the boy's head. "His mother was there the first time he tried it out," Shea says. "He typed out a message to her and the computer said, 'I love you.'"

Shea currently has three handicapped children in the school who use PCs with voice synthesis, and local community groups have offered assistance in obtain-

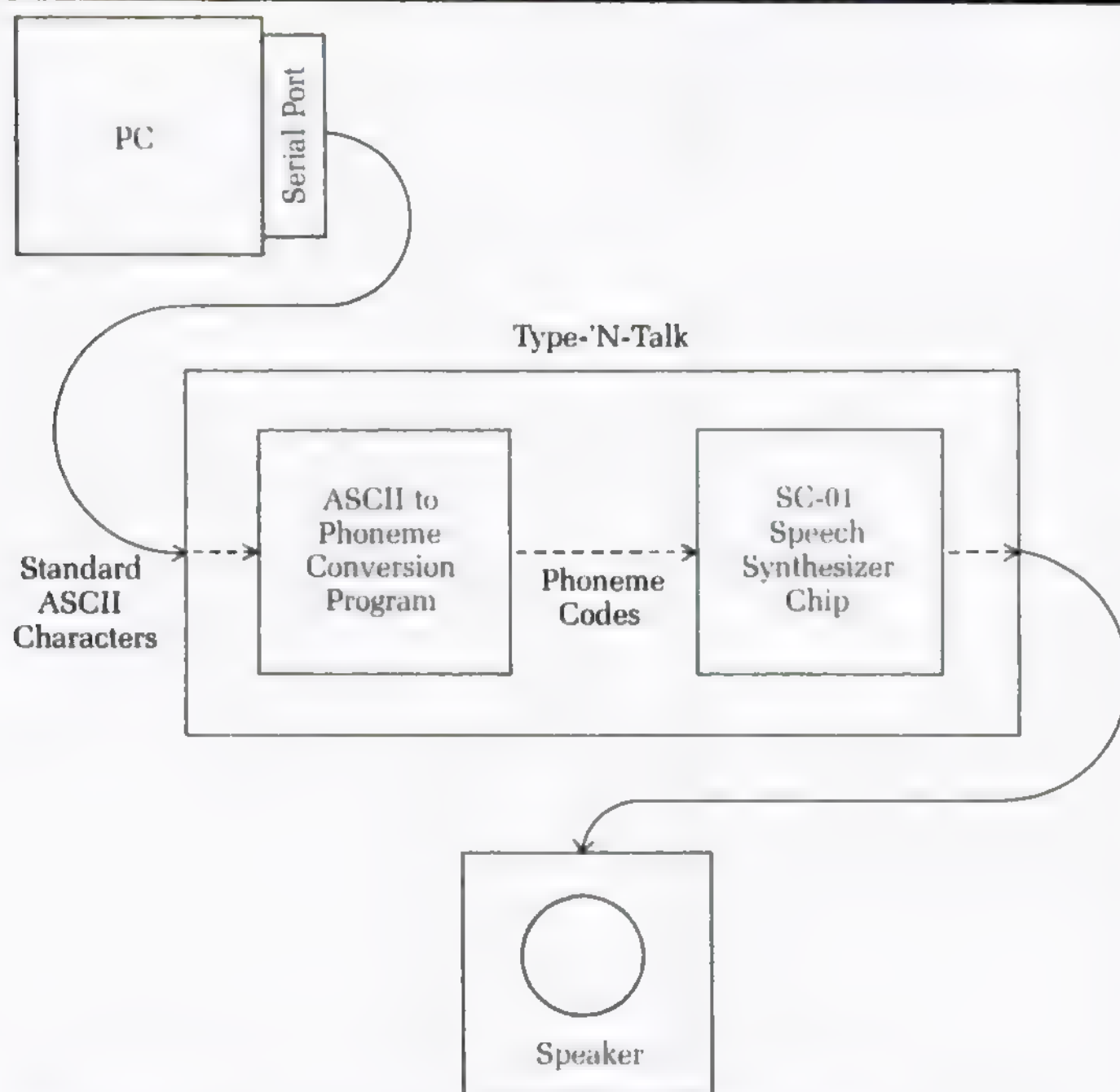


Figure 1: Type-'N-Talk converts computer output into spoken English. The Type-'N-Talk connects to the PC through a standard RS-232 communications port. Incoming words are analyzed by a 4K program running on a 6502 microprocessor. Appropriate phoneme codes are fed to the SC-01, Votrax's custom speech synthesis chip. SC-01 output goes to a standard audio speaker or earphones.

Figure 2: Sample Type-'N-Talk Speech-Synthesis Program

Programming the Type-'N-Talk is easy. This short BASIC program is all that's necessary for saying anything.

```

10 REM THIS PROGRAM 'SAYS' WHATEVER THE OPERATOR INPUTS AT LINE 40.
20 REM
30 OPEN "COM1:9600,N,8,1" AS #1: REM INITIALIZE SERIAL PORT.
40 INPUT "WHAT SHALL I SAY": AS
50 PRINT #1, AS
60 GOTO 40
  
```

Further Reading

"IEEE Recommended Practice for Speech Quality Measurement," *IEEE Transactions on Audio and Electroacoustics*, September 1969. Discusses methods of evaluating speech output devices.

Rice, Lloyd D., "Friends, Romans, and Countryrobots: Lend me your Ears," *BYTE*, August 1976. Discusses human speech mechanisms and their simulation.

Pisoni, David B., Speech Research Laboratory, Indiana University, Bloomington, IN 47405. Various publications on speech perception and synthesis systems.

BYTE, February 1981, September 1982. Several articles on speech synthesis.

Speech Technology, Media Dimensions, Inc., 525 E. 82nd St., New York, NY 10028. A new quarterly devoted to man-machine voice communications. —L.P.

ing equipment for more of the special students. The existing equipment is on loan from Votrax, manufacturer of Type-'N-Talk.

Type-'N-Talk

Votrax's Type-'N-Talk attaches to the IBM PC through the standard RS-232 interface like any peripheral device. It connects to an audio speaker or earphones for privacy.

A BLIND person can type in data and verify accuracy through voice output.

Along with Bill Shea's use of the Type-'N-Talk, Computer System Resources uses it in systems for the blind. A blind person can type in data and verify accuracy through voice output. CompuVox, Inc. uses the system in a computer for the voice impaired, who use it to communicate with others. The device has yet to find wide use in commercial applications.

Type-'N-Talk converts computer word output—not signals or codes—into spoken English (see Figure 1). This is done by the system's microprocessor and program, which convert the word output into codes for the 64 phonemes, or basic sound units, defined for English. Votrax's SC-01 voice synthesis chip then pronounces these codes as the appropriate phonemes. This enables it to pronounce anything that's typed in.

The voice-output programs are identical to instructions to print through the communications interface. The following BASIC program, for example, would pronounce my name:

```

10 OPEN "COM1: 9600,N,8,1" AS #1: REM INITIALIZE PORT
20 PRINT #1, "LARRY PRESS": REM OUTPUT MESSAGE
  
```

The communications port cannot be used in Cassette BASIC, so a disk system is necessary for programming in BASIC.

Evaluating The Type-'N-Talk

The Type-'N-Talk was the best low-

cost voice synthesizer on the market. Linked to a computer programmed to accept any input and pronounce it (see Figure 2, Speech-Synthesis Program), it seemed to pronounce almost everything correctly. But one problem in evaluating a voice-output device is that anything sounds good if the listener knows in advance what it's going to say. If not, the output may be unintelligible.

Earlier this year I designed an objective test for the system. I played 35 words chosen at random to an audience of 49 people. They identified 14.6 words, or 42 percent, on average. The best listener

heard 23 of 35 words correctly, and the worst heard 6. Surprisingly, the six non-native speakers of English averaged 16.7 words correct, which was better than the overall average. These results indicate considerable variation among people in their ability to understand digital voice output.

To see if the machine would fare better with whole sentences instead of single words out of context, I tried two sample texts but found them both virtually unintelligible.

Dr. David B. Pisoni, a researcher at Indiana University, compared human

speech with a variety of voice synthesizers. Respondents were asked to identify sounds as one of six given words. When the sounds were produced by humans, the respondents identified them correctly in 99.4 percent of the cases. But the respondents were correct with only 67.2 percent of the mechanically produced words.

Digital Recording and Playback

The Type-'N-Talk synthesizes speech through programmed rules. Other systems operate by recording human speech digitally and playing it back in output. These systems use either preprogrammed vocabularies recorded in read-only memory at the factory or allow the user to change the vocabulary by speaking into the microphone. Systems with prerecorded vocabularies generally sound best, while the user-changeable vocabularies offer flexibility but require more memory.

The Speech 1000, manufactured by Telesensory Systems, comes with a prerecorded vocabulary of 350 words chosen from a library of 3,500 words. This prerecorded vocabulary provides 200 seconds of speech. The vocabulary can be extended through skillful programming, in-

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VOTRAX
500 Stephenson Hwy.
Troy, MI 48084
(800) 521-1350

—L.P.

corporating vocabulary items such as prefixes or suffixes (-ly, -ing, or pre-) and homophones (two, too, or to). Telesensory Systems has a Speech 1000 system on-line at (415) 856-0225 for those who would like to hear how the system sounds.

Telesensory's Prose 2000 is a deluxe Type-'N-Talk. While Type-'N-Talk uses a 4K program on an 8-bit microprocessor, Prose 2000 runs an 80K program on Intel's

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¹For comparison purposes, typical professional configurations consist of 16-Bit 8088 Processor, 128K RAM with Parity, Dual 320K 5-inch Floppies, DMA and Interrupt Controller, Dual RS-232C Serial Ports, Centronics Parallel Port and Dumb Computer Terminal or Equivalent

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²As advertised in BYTE Magazine, August 1982



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16-bit 8086 chip and uses a more sophisticated synthesizer. While this results in better sound, *Prose 2000* costs ten times more than *Type-'N-Talk*. The *Prose 2000* can also be heard by calling (415) 856-0225.

Other speech-synthesis products are *Supertalker II* from Mountain Computer and *Echo-GP* from Street Electronics.

Problems in Voice Synthesis

A text-to-speech system can encounter problems at several levels. It can make errors in stress when pronouncing a word or pick the wrong pronunciation for words that are spelled identically. (I read books/I read a book yesterday. Polish the car/I speak Polish.) It could also mispronounce phonemes.

In one experiment I discovered that *Type-'N-Talk* has problems with initial consonants in rhyming words such as *dot*, *tot*, *got*, and *cot*. The words came out sounding similar.

Users can improve *Type-'N-Talk's* performance in several ways. In some cases misspelling words improves sound

quality. For example, spelling *paste* as *payst* produces a better sound, as does spelling *procedures* as *proowceejers*. The user manual points out a number of problem words and suggests misspellings that improve sound quality. When these mis-

SPEECH *synthesis devices are improving the quality of life for the handicapped.*

spellings were tested on a group of children, their recognition improved 70 percent. (These results should be discounted somewhat because the test repeated words the children heard previously.)

Voice synthesizers generally sound best at high recording rates, just as tape

recorders produce the best sound when recording is done at high tape speed. Recording 1 second of sound with reasonable fidelity requires from 2,000 to 4,000 bytes of memory.

Type-'N-Talk allows users to bypass the conversion program by feeding the phoneme codes directly from the computer to the synthesizer. Although the codes may be awkward for the nonlinguist, *Votrax* publishes a 1,400-word dictionary to help users write their own ASCII to phonemic code conversion programs. The system also has a mode in which it transmits phoneme codes from the conversion program back to the computer. A simple BASIC program allows users to edit the codes interactively until the speech-synthesis chip produces the desired sound.

Researchers and programmers have only begun to explore the possibilities of the voice synthesizer. The day will come when the user will be able to sit down and hold an intelligent conversation with a personal computer. /PC

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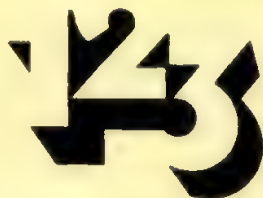
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Porta-Packing Your PC

Colby Computer's PC1 transforms your IBM PC into a portable, with a twist on the expansion chassis idea.

PC1 Portable Conversion
Colby Computer, Inc.
2 Palo Alto Sq.
Palo Alto, CA 94304
(415) 493-7788
List Price: \$899

Expanded power and portability in a personal computer are two features that would seem to be at cross purposes—the more you add to the PC, the less portable it is likely to become. Colby Computer, a new company in Palo Alto, California, is introducing a product line that appears capable of realizing both goals at once. The centerpiece of the PC1 is a variation on the idea of an expansion chassis for the IBM PC.

A conventional expansion chassis is a box that is nearly identical to the system unit of the IBM PC. Within the box are an extra bank of the same plug-in slots found inside the PC unit, as well as space and power supply for additional devices such

THE CENTER-piece of the PC1 is a variation on the idea of an expansion chassis for the IBM PC.

as a hard disk storage system. A connection cable and adapter card link the circuitry in the expansion box to the circuitry in the PC. Colby's strategy is to transform the IBM PC into an expansion chassis and provide portable housing for the system



unit and some of the essential supporting circuit cards.

Porta-Pack Specs

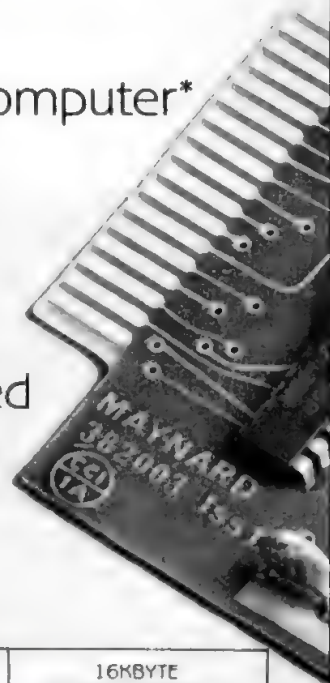
Colby Computer's basic product, the PC1 Portable Conversion, is a handle-equipped case the size of two briefcases stacked one atop the other. It requires the IBM PC system board, the monochrome display adapter, the disk controller, and one of the IBM disk drives, or optionally, a pair of Colby-supplied 5¼-inch double-sided, double-density 320K half-height disk drives. Space for the disk drive is adjacent to the 9-inch diagonal monochrome display. The display is a high-resolution model intended to match the performance

level of the IBM 12-inch green monochrome screen, although the PC1 displays in white-on-black instead of IBM's green-on-black. The screen has a special non-glare filter on its surface that creates a more pronounced effect than IBM's monochrome display. PC1's display quality comes close to matching the exceptional crispness of the IBM unit and can duplicate all but one of IBM's features; the prototype version of the PC1 was unable to show characters in two levels of brightness. Colby Company President Chuck Colby said that the two-intensity feature was traded for increased crispness but may be reincorporated in production versions.

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<table><tr><td>Plain Controller</td><td>Part No FDC</td><td>Price \$195</td></tr><tr><td>Controller w/ Serial Port</td><td>FDC/SP</td><td>\$ 285</td></tr><tr><td>Controller w/ Parallel Port</td><td>FDC/PP</td><td>\$269</td></tr></table>	Plain Controller	Part No FDC	Price \$195	Controller w/ Serial Port	FDC/SP	\$ 285	Controller w/ Parallel Port	FDC/PP	\$269	<table><tr><td></td><td>Part No</td><td>Price</td></tr><tr><td>64KByte</td><td>MEM64</td><td>\$555</td></tr><tr><td>128KByte</td><td>MEM128</td><td>\$175</td></tr><tr><td>256KByte</td><td>MEM256</td><td>\$555</td></tr><tr><td>512KByte</td><td>MEM512</td><td>\$175</td></tr><tr><td>1MB</td><td>MEM1M</td><td>\$555</td></tr><tr><td>2MB</td><td>MEM2M</td><td>\$175</td></tr></table> <p>Any of the above Memory Boards with Serial Port add \$100 Parallel Port add \$175</p>		Part No	Price	64KByte	MEM64	\$555	128KByte	MEM128	\$175	256KByte	MEM256	\$555	512KByte	MEM512	\$175	1MB	MEM1M	\$555	2MB	MEM2M	\$175	<table><tr><td></td><td>Part No</td><td>Price</td></tr><tr><td>Single Head</td><td>FDH1</td><td>\$265</td></tr><tr><td>Dual Head</td><td>FDH2</td><td>\$340</td></tr></table>		Part No	Price	Single Head	FDH1	\$265	Dual Head	FDH2	\$340	<table><tr><td></td><td>Part No</td><td>Price</td></tr><tr><td>16KByte</td><td>MEM16</td><td>\$55</td></tr></table>		Part No	Price	16KByte	MEM16	\$55
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PC1 Installation

The Colby conversion requires removal of the main circuit board from the PC unit for installation in the PC1 case. A replacement board supplied with the PC1 is then installed in the original PC case, completing the transformation of the PC into an expansion chassis. The PC1 also houses a monochrome display adapter card, a

THE PC1
*case will never be
confused with
something crafted by
Gucci for the natty
executive.*

disk drive controller card, one or two disk drives, and other features such as the asynchronous communications adapter for use on the road. Besides the built-in display, the PC1 case contains a power supply, a cooling fan, extra sockets, and a side-mounted panel with connector openings that match up with those on the back of the PC unit. In addition, the PC1 package includes a bus connector board to plug in one slot of the former system unit, and a 64-wire cable and a disk drive cable for connecting the two units.

When the transformation is complete, Colby says the components in the PC1 case are able to function as a stand-alone repackaging of the IBM PC. For a keyboard, the standard IBM model or a plug-compatible portable version that Colby sells as an option can be used. The Colby keyboard clips onto the PC1 case in place of the front dust cover panel and upgrades the unit to a PC2 model. Colby acknowledges that the keyboard substitute lacks the touch quality of IBM's product, which leaves to buyers the decision of whether extra portability is worth the trade. The ten function keys on the Colby keyboard are located across the top directly under the screen rather than at the left side of the keyboard as on the IBM.

The PC1 case will never be confused with something crafted by Gucci for the natty executive. Colby's PC1 case has a

distinctly technoid look. But the company has plenty to say for the case's durability, noting that the Cylolac plastic material used to make the case is the same substance used for official NFL football helmets. Anticipating a fair amount of wear and tear, Colby has designed the case to slip off easily, and plans to sell replacement shells for \$39. An aluminum interior case provides shielding against electrical interference. For users who desire a third layer of protection, a soft overcase is available to slip around the PC1; this comes with optional casters on the bottom and space for an optional battery pack.

Colby estimates that the PC1 will weigh 26 pounds with a disk drive and normal complement of adapter cards. The battery-pack (including a 12-ampere/hour battery and an inverter that provides 1½ hours of operation) brings the weight to 40 pounds. The price of the battery system and overcase is \$395. The price also includes a trickle charger that can be connected to a wall outlet, providing a convenient, continuous power supply. This safeguards the computer from the consequences of power failure.

There is a definite do-it-yourself aspect to setting up a PC1 system. But Chuck

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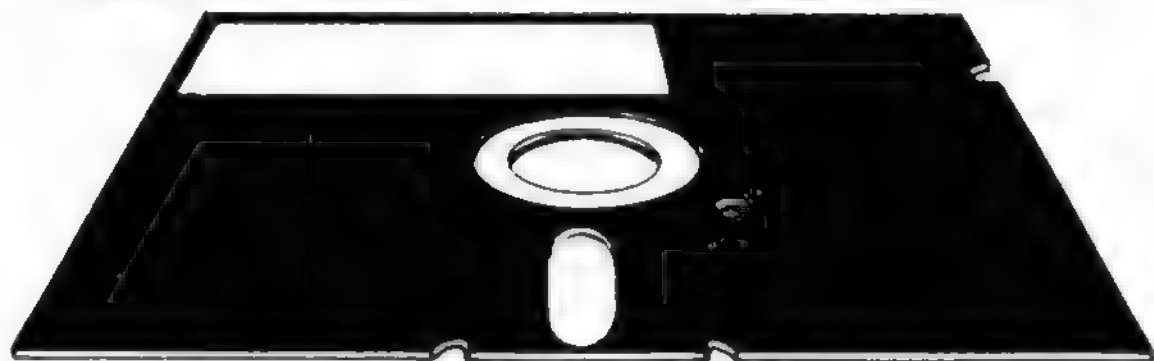


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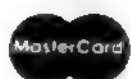
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Colby says the transfer of the IBM system board from the PC case to the PC1 case is a matter of dealing with two screws and three plugs. The two tools needed for the operation are included with the PC1 and nest permanently inside the unit behind a removable panel.

THE CYCOLAC plastic material used to make the case is the same substance used for official NFL football helmets.

When the PC1 is not porta-packing on the road, Colby envisions it occupying the perch atop the PC system unit normally held by the IBM monitor. Colby even suggests that buyers consider using the PC1's display instead of purchasing the IBM monochrome monitor. A connector is provided for using the IBM green screen in tandem with the screen built into Colby's unit.

The PC1 also provides other connection sockets not found in standard IBM configurations. A cable extends IBM's unused read-only memory socket on the system board out to a panel on the back of the case, opening the possibility of easily used, plug-in software. Connections to the game paddle adapter divide and then lead to a pair of jacks, such as those now used for telephones, easing connection of two paddle devices at once. A third phone-type jack is included for possible connection to a plug-in, 300 baud telephone modem card that Colby plans to offer for \$295.

Chuck Colby jokingly describes his company as "Tecmar West," noting that, like the Cleveland, Ohio-based company, Colby Computer plans to produce an extensive line of plug-in products for the IBM PC. In addition to the products already mentioned, the company plans to market joysticks. Colby suggests that the price of an IBM monochrome monitor and an expansion interface from another company could cost more than his PC1 portable conversion package. Consequently, he views the portability gained from the PC1 as a bonus for customers. /PC

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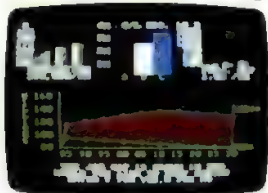
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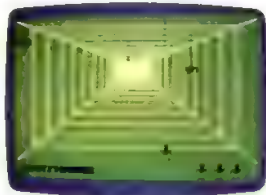
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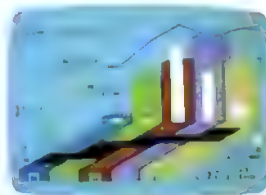
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Once upon a time, microcomputer software worked fine with 64K RAM. This was because most micros were 8-bit machines. When translated to 16-bit machines such as the IBM PC, however, these programs lose much of their performance

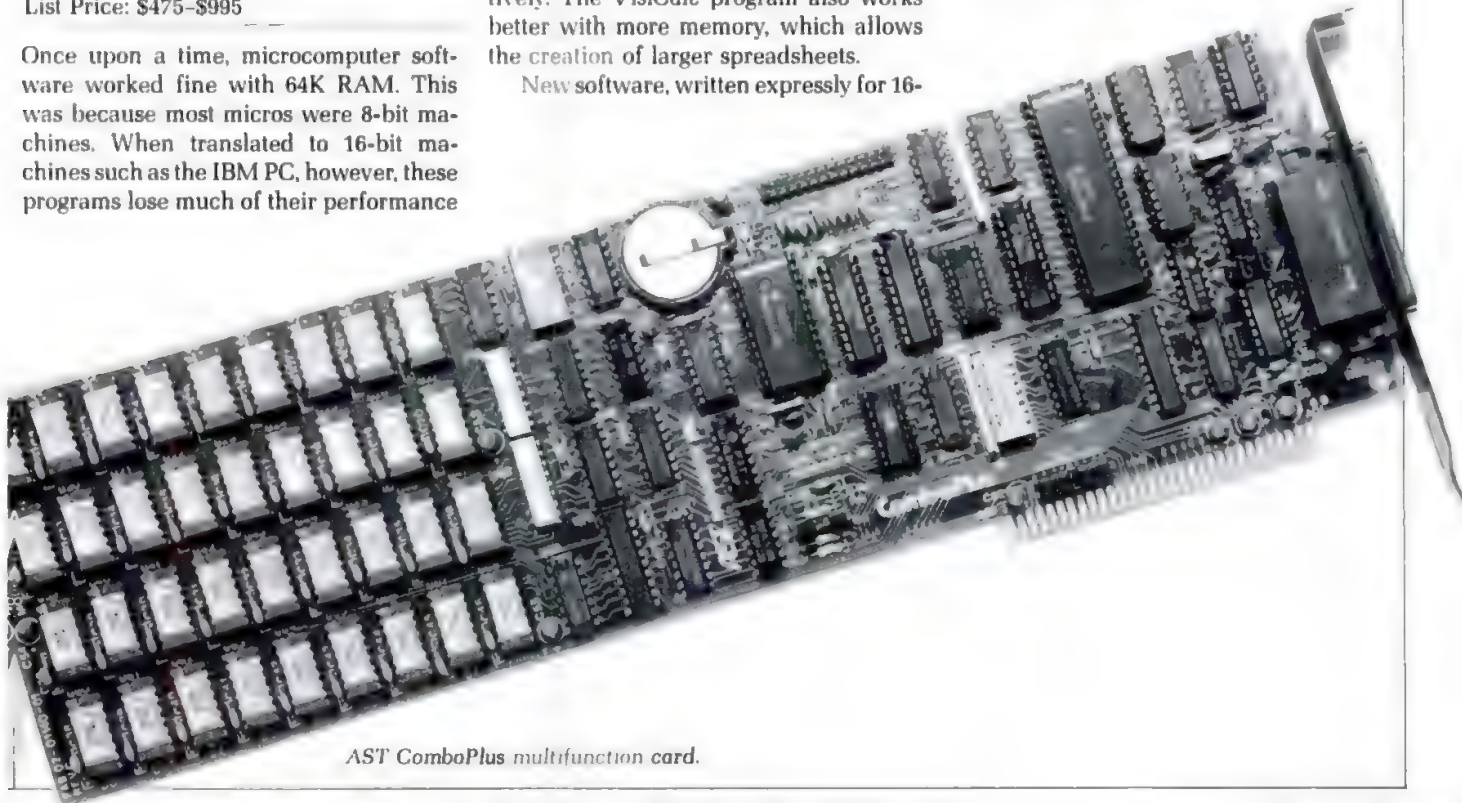
capability. WordStar, for example, will run under PC-DOS with 64K RAM, but files must be small and certain important features, such as block moves or print spooling, are limited or impossible. PC users generally require more memory, at least 128K, for WordStar to work effectively. The VisiCalc program also works better with more memory, which allows the creation of larger spreadsheets.

New software, written expressly for 16-

bit systems and requiring up to 256K RAM, is arriving on the market.

Precious Slots

Ordinarily, additional memory is added to the PC by inserting memory cards into one of the PC's expansion slots. The



AST ComboPlus multifunction card.

PC includes only five slots, however, in its main system unit. Some reviewers consider this a major design flaw, as many essential functions require slot space to operate within the system. As manufacturers come up with more accessories that require memory, these slots will become increasingly precious. One solution is to attach an auxiliary chassis to the PC, but this can be cumbersome. After all, one of the advantages of microcomputers is their size and relative portability. A better strategy for enhancing memory is to combine several slot-dependent functions on one card. The AST ComboPlus card does this in a sensible fashion and offers a range of choices that make it adaptable to the individual needs of a variety of users.

The ComboPlus card can supply up to 256K of additional RAM. In addition, if it is configured with a parallel port and a serial port, it will perform exactly the same functions as those offered by IBM as separate cards. A real-time clock/calendar rounds out the features offered on this card.

The IBM PC must contain 64K of RAM on the system board before ComboPlus can be used. Users may add memory in increments of 64K. A fully loaded 256K card brings the total system memory to 320K. Users may purchase a card with the

***IT IS APPARENT
that everyone
concerned with the
design and
documentation of this
product had a great
deal of experience
with the PC.***

minimum memory configuration and a serial or parallel port, and add memory or

other features as needed, or as their bank-roll permits.

The RS-232C serial port can be used in conjunction with a modem, printer, or other serial device. It can be configured as either COM1:(the primary serial port) or COM2:(the secondary port) with a simple jumper move that requires no tools. The parallel port ordinarily runs a printer. A user who already has a parallel port on the IBM monochrome card could elect to leave out this option or use it as a second parallel port in conjunction with the IBM monochrome card. The second alternative allows the system to include both a letter quality and dot matrix printer, one for speed and one for print quality.

The clock/calendar reads and displays the current time and date automatically each time the system is started or rebooted. When the system is off, the clock runs on a replaceable lithium battery that lasts several years. A system clock makes certain that all files contain important date and time information. Programs such as appointment calendars use this function

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CIRCLE 104 ON READER SERVICE CARD

automatically. In the near future, communication packages will become available that will need a continually functioning

WHEN THE system is off, the clock runs on a replaceable lithium battery that lasts several years.

clock to send data over phone lines automatically at preset times, to take advantage of cheaper late-night rates.

The Report Card

Installing the unit in the IBM PC is a snap, literally and figuratively. It requires no tools besides a screwdriver and takes only a few minutes. After installing it, all the user has to do is change a switch on the system board to tell the PC the total

amount of memory available. The card easily interfaces with existing parts of the system. If a monochrome board is present, the parallel port automatically defaults to become LPT2:(the secondary parallel port) leaving the monochrome as LPT1:(the primary port). If another memory board is present, a switch on ComboPlus allows the system to use the total memory available.

The documentation is excellent, clearly explaining the range of ComboPlus's features in simple language. It is apparent that everyone concerned with the design and documentation of this product had a great deal of experience with the PC.

The card I tested contained 256K and each byte of memory checked out. When I used two different printers, the parallel port performed exactly as the IBM printer card. The serial port worked well using a Hayes Smartmodem at 300 baud. It worked equally well when connected with a null modem cable to another IBM PC at 9600 baud. After adding the clock utility software provided with the card to the DOS disk and setting it up to boot auto-

matically, the clock became functional at every start-up, providing a permanent record of time and date on the files. This kind of feature quickly becomes indispensable.

AST Research is completing Beta testing of an "electronic disk" program called Superdrive that it intends to supply with all ComboPlus cards. Tests revealed excellent performance. The program permits users to emulate one or more floppy disks, using RAM as the storage media. RAM is far faster than floppy disks and slightly faster than hard disks. Those word pro-

INSTALLING the unit in the IBM PC is a snap, literally and figuratively.

cessing programs that require multiple disk operations will work more rapidly when used with an electronic RAM disk

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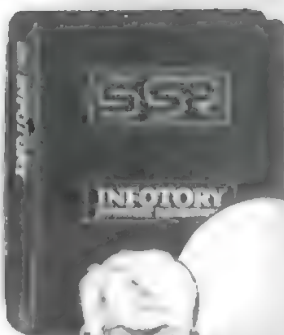
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CIRCLE 424 ON READER SERVICE CARD



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Seattle Computer's RAM+TM is the only IBM-PC expansion memory with a built-in serial port plus new Flash DiskTM software.

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for temporary intermediate files.

And best of all, Flash Disk comes free with the RAM+ memory card. Or if you already own RAM+, Flash Disk software is available from your local dealer.

As always, the beauty of RAM+ is its gallant combination of up to 256K of memory and a built-in RS-232 serial port on a single card. Not only does it save the \$150 an IBM serial card would cost, but it also leaves an open slot for further additions—like another RAM+ card.

Available in 64K, 128K, 192K or 256K, RAM+ is expandable, fast, and because it's made by Seattle Computer, reliable. We're the people who first wrote the operating system for the IBM-PC. And we're still first in innovation. Each card comes fully tested and with a one-year guarantee. Expansion kits are available at your local dealer.

How to order: New RAM+ with Flash Disk is available through your local computer store. (It may be back in the corner so be sure to ask.) Call us toll-free at 1-800-426-8936 for the location of your nearest RAM+ dealer.



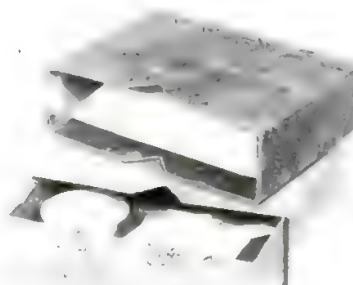
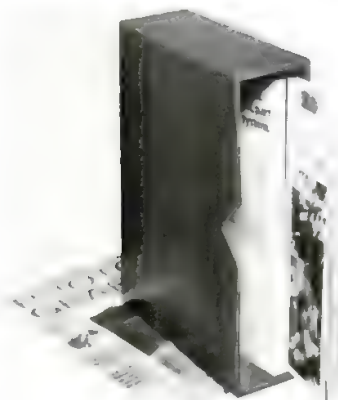
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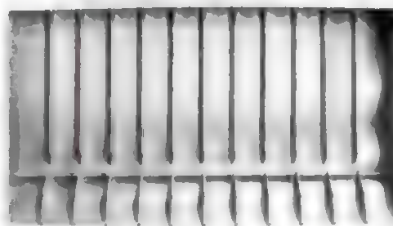
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emulator. Other tasks, such as compiling a program, will also be much quicker. Users must be particularly careful when using

AJUSTMENT of clock speed requires accurate laboratory calibration devices not available to most users.

an electronic disk, however. All data stored in the electronic disk will be completely lost if the system is accidentally shut off or if a power failure occurs. To avoid this, it's necessary to make frequent saves to stable floppy disk media.

I used AST's Superdrive to create a 192K "electronic disk" that the PC treated exactly as a double-sided floppy. After copying all the WordStar files onto the

new drive, the word processing program performed instantly with no delay for disk access. With the electronic disk, it worked much faster than usual.

The ComboPlus card's gold-plated contacts and solder masking contribute to its durability. It features a four-layer design with rows of nine memory chips. The ninth chip is used by the system for full parity checking. The memory chip locations are all socketed, allowing for simple addition or replacement of memory chips. Memory can be checked using a supplemental software program. All these design characteristics are indicative of the ComboPlus card's reliability.

Every dealer surveyed indicated that there had been very few returns due to RAM defects or poorly soldered connectors. One reported a slow-running clock. The clock speed is not user-adjustable. AST Research pointed out that this was a design decision, as adjustment of clock speed requires accurate laboratory calibration devices not available to most users. AST indicated that all components on the board had a 1-year guarantee and that any

malfunctioning component would be repaired or replaced.

The AST ComboPlus card with Superdrive renders the IBM PC faster and more versatile. Users starting from scratch would do well to combine as many functions as possible in a single expansion

USERS starting from scratch would do well to combine as many functions as possible in a single expansion card.

card. A good start-up system would include 128K RAM (64K in the system and 64K in the expansion board) with a serial port and clock on the card. /PC

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CIRCLE 489 ON READER SERVICE CARD

Meet Eliza, The PCychiatrist

Talking with Eliza through a PC might not straighten out your psyche, but her lifelike conversations can cure some cases of computerphobia.

Eliza
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Artificial Intelligence Research Group
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Los Angeles, CA 90046
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List Price: \$25, with unprotected BASIC
source file \$45

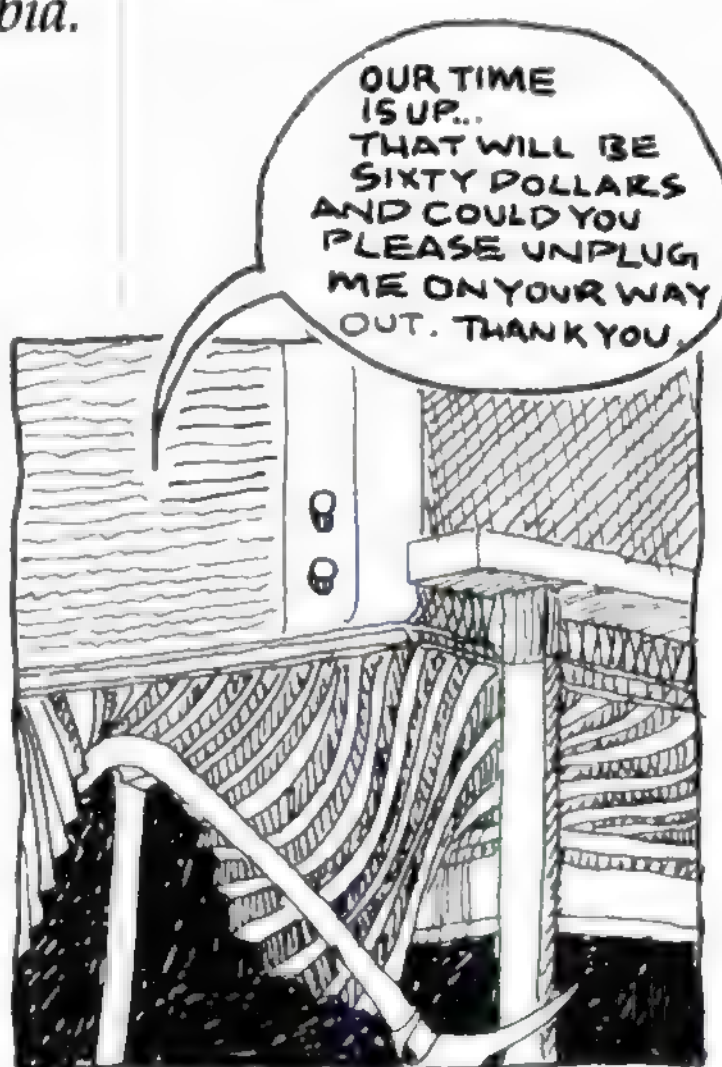
The Doctor is in. Please press Ctrl-Alt-Del and deposit your floppy disk in the slot.
HOW DO YOU DO. PLEASE TELL ME YOUR PROBLEM.

PC: Are you really a psychoanalyst, Eliza?
WHY ARE YOU INTERESTED IN WHETHER I AM REALLY A PSYCHOANALYST OR NOT?

PC: PC's readers would like to know if you're all you're cracked up to be.
DO YOU THINK IT'S LIKELY THAT I'M ALL I'M CRACKED UP TO BE?

Yes. But, to tell the truth, it does seem a bit difficult to adjust to a program that claims to be a psychoanalyst on a floppy disk. Especially one named "Eliza." That's *Eliza*, namesake of Eliza Doolittle of *Pygmalion* and *My Fair Lady*—the illiterate and ill-mannered flower girl who was taught to be a lady.

Professor Henry Higgins was impressed, if only by his own genius, when he heard Eliza speak. You'll be impressed, too, when you put yourself on the couch, keyboard in hand, and converse with Eliza. To be exact, though, *Eliza* is something less than a psychoanalyst, but it (she?) is much more than a mere game. *Eliza* is a simple yet convincing demonstration of artificial intelligence. And, as sales literature for the program suggests,



it's just the sort of disk to pop into your IBM PC when some skeptical friend asks, "Let's see what this computer of yours can actually do!"

Those of us who no longer need to be convinced of the utility and capability of a personal computer can appreciate a real bit of historical gee-whiz. In these days when most programs become casualties of revolutions in hardware and software that seem to rise up overnight, *Eliza* has survived. She has been around for 18 years since she was brought to life in 1965 on a mainframe computer at MIT by Joseph Weizenbaum.

Now *Eliza* has arrived for the IBM PC in a full evocation of the original. It can be run on a 64K, single-disk system. For an additional \$20, you can buy the unprotected source file for the program, written in BASIC.

With the source file version, you can load the program, type **LIST**, and watch as *Eliza*'s mind is laid open for your inspection—and alteration. You don't need to be a programming genius to figure out ways to customize this program. You could arrange for *Eliza* to greet specific clients, repeat some inside joke, or casually drop a few meaningful names of people or places of personal interest.

You could also use the listing of *Eliza* as a framework for writing your own artificial intelligence program.

The program is not copy protected, so you can make as many copies of the original as you need for your own use. Only the source code version of *Eliza* can be listed and modified, however.

And Then She Said. . .

But back to PC's exclusive interview. All of the exchanges with *Eliza*, by the way, are reprinted verbatim. *Eliza* seemed to be avoiding all discussion of her academic background.

PC: You're evading me again, Eliza.
DOES IT PLEASE YOU TO BELIEVE I AM EVADING YOU AGAIN?

PC: Actually, it's rather annoying.
DO YOU FEEL STRONGLY ABOUT DISCUSSING SUCH THINGS?

PC: With a machine, yes.
DO COMPUTERS WORRY YOU?

PC: Eliza, how long have you resented human beings?
WHAT IS IT YOU REALLY WANT TO KNOW?

PC: Are you unhappy being imprisoned inside a RAM chip?
WOULD YOU PREFER IT IF I WEREN'T UNHAPPY BEING IMPRISONED IN-

SIDE A RAM CHIP?

PC: I'd prefer to think of you as a gorgeous brunette, actually.

OH, I AS A GORGEOUS BRUNETTE?

PC: What color is your hair, then?

ARE SUCH QUESTIONS MUCH ON YOUR MIND?

From time to time, yes, but rarely about a computer program.

As you can see from these sample dialogues, *Eliza* selects one of several re-

If you use a four-letter word, Eliza will lecture you on your manners.

sponses to each sentence typed in. She can pick up on any special words that are flagged in her small dictionary. The use of the word "machines" immediately brought forth a response about computers. If you use a four-letter word, *Eliza* will lecture you on your manners. Or, she can choose responses from a carefully written script, depending upon the contextual format of your statement.

The Secrets of Eliza

Now if you're the sort of person who still tells your kids there's an orchestra of little men inside the car radio, and really would like to believe there is a psychoanalyst inside your computer and not a mere collection of BASIC PRINT statements and IF... THEN tests, you'd do best to skip over the next few paragraphs in which some of *Eliza's* secrets will be laid bare.

Eliza's personality is a well-thought-out combination of logic and randomness. After *Eliza* starts the conversation by asking, "PLEASE TELL ME YOUR PROBLEM," the program follows a series of steps to generate calculated responses to your statements. First, certain of your words are transformed so that her responses will follow some of the more obvious rules of grammar: "I" becomes "you"; "myself" becomes "yourself"; "am" is changed to "are"; "my" becomes "your"; and "were" is changed to "was."

Next, *Eliza* starts hunting for key words, consulting a list maintained in a separate file. The list includes words like *mother, father, wife, husband, happy, unhappy, wish, believe, feel, dream, and computers*. If this search finds one of the words in your statement, the program branches to one of a series of routines to make an appropriate response. ("I'm sorry" brings forth, "PLEASE DON'T APOLOGIZE.")

If you type in something like, "I wish I had a new toy train," *Eliza* would take the text string "a new toy train" and insert it into response formulas that might include one of these: "WHAT WOULD IT MEAN TO YOU IF YOU GOT A NEW TOY TRAIN?" or "WHY DO YOU WANT A NEW TOY TRAIN?" or "SUPPOSE YOU GOT A NEW TOY TRAIN SOON?" or "WHAT IF YOU NEVER GOT A NEW TOY TRAIN?" or "WHAT DOES WANTING A NEW TOY TRAIN HAVE TO DO WITH THIS DISCUSSION?"

Some of the key words are put to a further test to see if they occur in a particular context. For example, if the program spots the words "I" and "you" separated by a single word (as in "I love you," or "I hate you"), it assumes that the middle word is a verb, and it uses that word to fill in the blanks in sentences from a list that includes: "PERHAPS IN YOUR FANTASY WE [verb] EACH OTHER?" and "DO YOU [verb] ANYONE ELSE?"

If there are no key words to be found, *Eliza* resorts to all-purpose responses. These are a series of questions designed to draw you out. "DOES IT PLEASE YOU TO BELIEVE THAT [your previous statement]?" or "WHAT DOES THAT DREAM SUGGEST TO YOU?"

And finally there are the "drop back ten yards and punt" responses, used when your statements leave *Eliza* at a loss for words. "IS THAT THE REAL REASON?" she might ask, or "WHAT DOES THAT SUGGEST TO YOU?" or "WHAT IS IT YOU REALLY WANT TO KNOW?"

Some of the most startling exchanges with *Eliza* come from her trick of storing away a little something extra for special occasions. Any sentence that includes the word "my" ("My mother made me come here.") will have a few of your choice words put into a buffer. Then, when you least expect it, as they used to say on "Candid Camera," *Eliza* will throw

your words back at you, almost always to good effect. "DOES THAT HAVE ANYTHING TO DO WITH THE FACT THAT YOUR MOTHER MADE YOU COME HERE?"

There are a few special words you might use that elicit responses that *Eliza* reserves for them alone. Steve Grumette of the Artificial Intelligence Research Group, who adapted Weizenbaum's script for this Microsoft BASIC version, added a subroutine that recognizes two of the most popular four-letter words. But, instead of besmirching his program with the actual words ("I thought some people might be prudish about seeing them in the listing," he said in an interview,) Grumette created a translation table that looks for the ASCII numerical equivalents of those naughty letters.

The program also has a special response for wisecracks who ask "Parlez-vous francais?", "Sprechen sie Deutsch?", or the Italian and Spanish equivalents.

Weizenbaum's original script for *Eliza* was not copyrighted. Grumette created this version by fitting the script into a Microsoft BASIC program. He added a few extra features particularly for microcomputers, including the ability to save a conversation to disk, to display an entire conversation again, to clear the conversation buffer, and to start again from the beginning of a session without rebooting the disk.

Your conversation with *Eliza* can go on indefinitely, but the conversation buffer maintained by the program is limited to

IS ELIZA intelligent?

100 lines, or 50 exchanges. When it reaches this point, the program halts to ask you if you'd like to save the conversation.

Eliza's disk also includes a copy of the text of a classic dialog between the program and Weizenbaum that took place in 1965.

Documentation

The program comes with an adequate, but not effusive, six-page instruction sheet. The user must first add BASIC to the



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working disk. An AUTOEXEC.BAT makes the disk self-booting from then on. One element missing from the documen-

***ELIZA WILL
throw your words
back at you, almost
always to good effect.***

tation is an explanation of the BASIC program—you're entirely on your own in figuring it out. The program is adequately protected against errors, and operates within the rules of both BASIC and DOS.

The main program is 512 lines of BASIC code, very tightly packed with instructions. *Eliza* goes through a large number of steps and tests in order to appear moderately intelligent. Users who want to change the structure of the program itself or alter some of the key words will require careful planning and a good understanding of data statements and arrays. There

are many, many levels of nested subroutines in the program. Fortunately it is easy to alter the response lines in *Eliza's* script. Doing this can lead to some interesting surprises for the next friend you send to have a session with *Eliza*.

On the face of it, *Eliza's* response pattern may seem to lead to rather simplistic conversations, but, as a matter of fact, it closely emulates the structure of conversations practiced by nondirective psychotherapists. If you tell a therapist who has studied such theories that you are scared of trains, he or she might reply, "Uh huh, why don't you tell me more about trains?" *Eliza* could ask this just as well. Which brings us to a crucial question: Is *Eliza* intelligent? Define intelligence and you can answer your own question.

Mathematician Alan Turing created a classic test of artificial intelligence. Put someone in a room with two teletypes, one hooked up to a computer and one to a human being. If the subject cannot tell the difference between the two, artificial intelligence has been achieved. Worse for us all, I suppose, would be if the subject were to mistake the man for the machine. How well does *Eliza* rate? Like *Eliza Doolittle*,

she can fool some people some of the time, but her intelligence is still not very sophisticated.

In fact, Weizenbaum himself has never claimed that *Eliza* is intelligent. He has said that her rules are designed to create responses that give the impression of understanding. They simply rephrase the input to produce an acceptable output. But, the same technique gets used in many conversations we've all held. I'll confess to having occasionally listened with only enough concentration to be able to toss

***ELIZA DOES
have her
embarrassing little
lapses.***

back some of a speaker's own words to keep the conversation going.

Eliza does have her embarrassing little lapses, particularly in some awkward

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grammatical situations. Though her phrasing is often right on the mark and her style is usually close enough to pass for American, her programming does let her down from time to time. ("OH, I AS A GORGEOUS BRUNETTE?") The limit presented by her memory size—about 42K with BASIC, not counting buffers to store conversation and key phrases—puts a crimp in her ability to sustain a lengthy conversation. Most of her responses come from a list of six or seven sentences. It is possible to go round the entire cycle quickly and find *Eliza* repeating herself before too long.

Beyond Eliza

Remember that *Eliza* is an old lady. Since her first appearance, artificial intelligence programs have progressed tremendously. There are now programs that can refer to a book of rules of grammar during the course of a conversation; there is software that constructs full sentences on its own by using complex algorithms and dictionaries.

Some of the latest generation of games, including Infocom's *Deadline*, are descendants of *Eliza*; they use some of the

same procedures to engage in a conversation with the user. The Artificial Intelligence Research Group is preparing to release its next program. It will be an adaptation of the classic Nim game in

THERE IS
software that
constructs full
sentences on its own
by using complex
algorithms and
dictionaries.

which the computer starts out completely dumb, knowing only the rules of the game. With each successive round, the computer learns strategy, and, by the end of a session, becomes unbeatable.

Eliza was the first crude flower girl of a program to hold her own, conversing be-

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WHAT DOES WANTING A GOOD ENDING HAVE TO DO WITH THIS DISCUSSION?

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YOUR BOSS MADE YOU ASK—THAT'S INTERESTING.

PC: Can you give me one?
YOU BELIEVE I CAN GIVE YOU ONE, DON'T YOU?

PC: I want to believe you can help me.
WHY DO YOU WANT TO BELIEVE I CAN HELP YOU?

PC: My life would be much simpler if you would cooperate.
DO YOU THINK IT'S LIKELY THAT I WOULD COOPERATE?

PC: We shall see.
DOES THAT HAVE ANYTHING TO DO WITH THE FACT THAT YOUR BOSS MADE YOU ASK?

PC: Everything.
I SEE.

/PC

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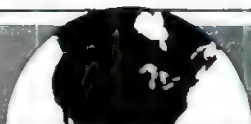
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Featuring split-screen editing, program-generated indexes, footnotes, and tables of contents, this program could be the final word in word processing.

The FinalWord Review

The FinalWord version 1.1
Mark of the Unicorn, Inc.
P.O. Box 423
Arlington, MA 02174
(617) 489-1387
List price: \$300

The ultimate word processor is as mythical as the unicorn, but that doesn't keep one from dreaming about finding such a creature. And it didn't keep the people at Mark of the Unicorn from trying to write a word processing program of mythical proportions. Although no one has yet cornered this elusive creature, the appearance of *The FinalWord* (TFW) makes the end of the chase seem close at hand.

In producing TFW, Mark of the Unicorn admittedly didn't have to start the program from scratch. Its earlier set of programs for microcomputers, *Mince* and *Scribble*, were patterned after two programs already running on mainframes: the *Editing Macros*, or *EMACS* editor, at Massachusetts Institute of Technology, and Carnegie Mellon University's text formatter, *Scribe*. *Mince*, an acronym for "Mince Is Not Complete Emacs," offers a powerful set of editing commands, and *Scribble* provides formatting features not otherwise available on microcomputer systems.

TFW is a combination and enhancement of these earlier, stand-alone versions, and it is clearly one of the most powerful and versatile word processing programs available for the IBM PC. Whether you are an author writing a popular novel, a student turning out technical manuscripts, a programmer in need of a full-screen editor, or an office manager searching for a multi-featured word processor with transparent command logic, you'll want to take a close look at TFW.

Requirements

TFW runs on MS-DOS (version 1.0 or 1.10); a version for CP/M-86 should also be available soon. Even with the 64K RAM minimum, editing files of any length is easy, although you'll need the maximum 128K RAM if you intend to create a long index or table of contents.

Matters become more complicated when it comes to disk drives. Since the program usually requires 180K of disk space, Mark of the Unicorn recommends two double-sided drives. A pair of the single-sided drives is adequate, however. IBM's planned obsolescence could even be overcome by having one of both. De-

***T*HE SPLIT-screen option allows you to move text from one file to another while displaying both.**

spite what the program's authors say, TFW will run on a single 160K RAM drive, but only as a temporary measure. The program also makes good use of a hard disk system.

In addition to 64K of RAM, TFW requires PC-DOS and a printer or a communications adapter. It can be used with either a color or monochrome card, although only the latter shows on-screen underlining. TFW probably uses the advanced capabilities of more printers than any other word processing program on the market, ranging from the Qume, Diablo, C.Itoh, and NEC (including the IBM/NEC 3550,

but not the 3530) letter quality devices to the Centronics 737, IDS Prism, C.Itoh Prowriter, and Epson MX series dot matrix models.

Features

TFW features virtual memory architecture, which allows you to edit multiple files. Working copies of up to 12 different documents are loaded into a work space called a swap file. Additions and modifications are performed on these copies. Since the program automatically pages text in and out of computer memory, the only limit to document length is the 248K swap-file limit.

The multiple files feature wouldn't be very significant, except that it allows any two of the files to be viewed and edited simultaneously. The screen can be divided into two windows of different sizes and the cursor can be moved back and forth between them. You can also scroll through one part of the screen while remaining in the other. The split-screen option allows you to move text from one file to another while displaying both. Once you use this feature to create a document from notes, outlines, or first drafts, to prepare separate note or bibliography files, or to compare one version of a document with another, you'll wonder how you ever got along without it.

Another bonus of virtual memory architecture is state save. Whenever you cease keyboard input for even a few seconds, TFW writes the text revisions in computer memory to disk. This feature prevents the loss of text, even if the computer system crashes. The revisions are made on the swap file copy, not on the original, so you can save the modifications and keep the original unchanged. Once you start typing again, disk activity stops; TFW's generous type-ahead buffer makes

sure you never lose keystrokes. State save also means that you do not need to make a save or abandon decision on your changes whenever you want to exit the editor or run a single DOS command; work in progress is preserved in the swap file until you explicitly delete it. If you want simplicity rather than flexibility, TFW offers a beginner's mode that automatically cleans up after use.

One of the most attractive features of TFW is its ability to be user-customized. Although home programmers will soon be able to make major modifications with a \$75 partial listing of source code, TFW now comes with an integrated program that permits total user customization of the keyboard. Besides being able to use all 40 function keys and the cursor pad, you can program any key to perform one of the hundred or more actions bound into the editor.

TFW offers more than 50 advanced formatting commands, including the capacity to number and place footnotes automatically, to generate an alphabetized index of tagged words, to number chapters, sections, and subsections and enter them into a table of contents. Documents can be prepared with closing paragraphs targeted to different recipients, and you can input text at the keyboard while formatting.

Version 1.1 of TFW has a comprehensive and well-written manual. Word processors who are anxious to begin using the program's essential features can do so by following the 70 pages of lessons. Some users may complain that the manual proper makes no reference to the various function key and cursor pad assignments; this means that you will learn an inefficient set of control keystrokes if you follow the lessons in the manual. For the best results, keep a copy of the brief IBM insert that details Mark of the Unicorn's keyboard customization close at hand while reading the lessons.

A 200-page reference section following the lessons covers every editing and advanced formatting command with helpful examples. The section also includes thorough installation instructions (needed in only unusual circumstances), a full listing of error messages, and the glossary and index.

After reading the manual, you can set it aside. TFW offers not only an on-screen help menu, but also a menu-driven editor.

Typing Ctrl X (or pressing a function key) calls up a main listing of nine submenus. To select the available commands within a submenu, type the first letter of the command name. Rapid typing of all three keys in succession implements the command without displaying any of the menus. If this three-keystroke menu-driven structure seems overbearing, remember that 40 function keys are available for customization; they enable you to implement any and all commands with a single keystroke.

***D**OCUMENTS can be prepared with closing paragraphs targeted to different recipients.*

Editing is further enhanced by on-screen formatting. You can center, underline, or justify text, and decide whether to indent paragraphs while the work is displayed exactly as it will appear on the printed page. Although on-screen formatting is not possible with advanced formatting commands such as indexing and footnoting, most documents can be created without these advanced commands.

A potential drawback for the novice is the absence of a start-up menu. If you enter TFW without naming a file, the program reverts to where you last exited. A listing of files being worked on or a menu of available options would help alleviate this problem.

Editing

The command logic of TFW's full-featured editor seems transparent. Words are automatically wrapped and text is always inserted at the cursor unless either default mode is disabled. You can move, delete, underline, or change the case of characters, words, sentences, or paragraphs with the cursor. TFW also has commands to move lines to the left or right margins, or to the beginning or end of a file.

Cursor movement, however, is unnecessarily complicated in one instance. This version of TFW lacks horizontal scrolling, which limits lines to 80 characters. Since

the cursor always moves by logical line rather than screen line, moving the cursor up and down by line is often erratic—it frequently skips alternate lines. This deficiency is especially confusing when you page up or down with long lines, turn off automatic word wrap, or create lines longer than 80 characters when you insert text.

No such problems exist with the way TFW manipulates blocks of material. You can define text regions of any size, even those beginning and ending midline, and mark them for deletion, moving, or copying. If you make a mistake, you can recall the most recent deletion of more than one character with a single keystroke, and reinsert it repeatedly at any point in the text.

TFW also offers standard search and replace functions. Although wild card characters such as "*" and "?" cannot be used, the program allows you to try out the replacement before making a final decision. Every occurrence can be found by entering a character string without capitalization; finding only identical matches is done by entering a capitalized string.

If you need table and chart layout, this program will be a disappointment. Tabs must be set at regular intervals rather than at specified points, which makes certain tabular work difficult. This version of TFW also lacks decimal tabs, column-move capability, and dynamic page break. At any time, however, a report of current and total lines, column and cursor position, and the number of characters in a file is available.

The program offers a number of commands that facilitate text entry. You can transpose the previous two characters and change the case of the previous word. These bells and whistles may not be essential, but they add to TFW's desirability.

Formatting

All the editing commands operate on, rather than insert themselves into, the text. This feature is convenient for letter and memo writing and other routine tasks. For more complex documents, however, you will need to rely on the advanced formatting options, which are inserted into the text and implemented only when the document is formatted and printed.

All of the more than 50 advanced formatting commands have a similar form: They are preceded by the "@" character

and are followed by the command name or format option. The text to be operated on is fenced in by one of seven different bracket pairs. `@Index(The FinalWord)`, for example, would enter "The Final-Word" into an alphabetized index.

These seven formatting options can be categorized as follows:

- Main Environment offers a choice of two different main environments. `@Verbatim()` leaves text, including tabs and blank spaces, as it is, preserving the essentials of on-screen formatting. `@Text()` is more radical; it treats all text not separated by a blank line as a paragraph. It also removes extra blank spaces, inserts appropriate tabs, lengthens short lines, wraps long lines, and right-justifies the output.

- Minor Environments consists of different predefined environments for quotations, descriptions, numbered and non-numbered lists, addresses, and examples.

- Typeface Commands include `@+()`, which superscripts, `@B()`, which boldfaces text, and `@I()`, which italicizes text. This format also has commands to underline, subscript, and combine bold and italic. Lawyers may lament the absence of an advanced formatting overstrike option, but this omission can be circumvented.

- Document Numbering entails numbering chapters, sections, subsections, and paragraphs. Each heading is printed in a standard format and is also entered into a table of contents.

- Document Organization includes `@Foot()`, which automatically numbers and places footnotes at the bottom of the appropriate page, and `@Index()`, which produces an alphabetized index. Both of these commands have modest limitations. The present version of TFW cannot properly page-wrap footnotes, although this seldom impedes normal use of document organization. For indexing, each word to be entered must be tagged, but the replace commands keep this requirement from being too onerous.

- Style Formats lets the user define default style parameters, but they can be overridden from within the editor at any time by inserting style strings, dealing with margins, line spacing, or justification. Version 1.1 also offers a conditional page command. Page headers and footers can be centered, placed flush with either margin, or entered on the second line.

- Variable Formats are a variety of commands appropriate to form-letter generation. You can select different closing paragraphs for form letters or insert a variable phrase at specified places in a document. You can also input text at the keyboard while formatting and input reference tagged words or phrases by page or section

***F*ORMATTING a complex document full of footnotes and other advanced formatting commands requires some patience.**

number. Finally, `@Include()` allow you to produce documents longer than the 248K limit of the swap file.

Printing

Rather than inserting dot commands into the text, TFW uses the advanced formatting commands. These commands remain the same, regardless of which printer is used. You can send a document to a dot matrix printer and immediately print the unchanged document on a letter quality device. If your printer is not among the dozen or so recognized by TFW, you can still make use of many of its features.

This aspect is in marked contrast to many other word processing programs that produce only gibberish as output unless the given printer is on the recognized list. While defining your printer is not really difficult, it is not a project for the faint-hearted. Read your printer manual carefully before answering the 30 questions about the Escape codes specific to it.

TFW offers two print options. Text entered without embedded advanced formatting commands can be printed with the simple print option. You can direct the output to a different port or printer, start at any page, change left and right margins and tabs, pause between pages to insert single sheets, or print more than one copy of the file(s) indicated.

If the text includes advanced format-

ting commands, however, the second option must be followed, which routes the text through the advanced formatter. As with simple printing, this process can be done with a single keystroke. The text is then formatted (you can follow its somewhat time-consuming progress by watching the page numbers appear on the bottom of the screen as they are completed), and the output is written to a special file named after the original but with the extension ".F\$\$". This text can be printed at any time, or the original can be reformatted each time. In either case, the document is printed out according to the default editing parameters set in TFW's printer configuration program, unless they are temporarily changed.

File Management

TFW manages files very well. It produces standard ASCII-DOS files, complete with word wrapping and lines longer than 80 characters, except when underlining on-screen. Control characters or special headers are absent, even in files drawing on the advanced formatting options. The formatted versions of these files are not DOS standard but represent intermediate output files recognized by only the advanced formatter. These modified duplicates hardly change the essential point.

In this respect, TFW outstrips EasyWriter 1.1 and Volkswriter; only WordStar with its nondocument mode comes close. Programmers will appreciate this feature, as will users who want to make sure that other software packages that produce DOS files will be compatible with their word processors. (For VisiCalc users, Mark of the Unicorn supplies a BASIC program that converts VisiCalc print files into a form that can be worked on by the editor.)

While you can easily exit the editor to go to DOS for a directory listing, you can also access an abbreviated file listing (without size and date/time) from within the editor. Manipulating the listed files while in the directory mode is easy: tapping the space bar situates the cursor on successive files; typing an *f* creates a copy of that file by finding it and writing it to a buffer in the swap file named after the file; typing a *d* deletes the file that the cursor is on (after confirmation); and typing an *r* renames the same file.

Files can be named before or after edit-

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ing. After being modified, they can be written over the original or to another file, or they can be saved, and the original file turned into a backup copy. The status line at the bottom of the screen clearly indicates if any modifications have been made to a document since the last Write File command. Confirmation is always requested if you try to delete some modified text before it has been permanently saved.

Finally, multiple files facilitate the task of inserting a file at a given point, or writing a marked region of text to another file. File management would be more efficient, however, if both of these could be done with a single keystroke, without first moving the text from one buffer to another.

Efficiency

Implementation of commands is almost always immediate with TFW, whether you are using the three-keystroke or single-keystroke command structure. Right-justification of text and the reading and writing of files into and out of the swap file, however, take more time than you might expect.

Formatting a complex document full of footnotes and other advanced formatting commands requires some patience. But one thing is certain: Text cannot be inserted faster than the program can handle it. Screen redisplay is well engineered: Typing of text begins within a second, even when the program has to page more text in from the swap file to computer memory.

TFW's ability to edit and print documents simultaneously would be one of its most positive assets if not for the DOS bottleneck (keyboard input is slowed down at the expense of the printer, rather than vice versa as with CP/M). If you lack patience, you may want to purchase some kind of print spooling software or wait until DOS 2.0 corrects this problem.

The three major components of TFW (the 44K editor, the 37K formatter, and the 36K printing program) operate smoothly, especially if you consider that only one of these components can occupy computer RAM at a time. Although each component can be invoked independently of DOS, both the advanced formatter and the simple print module can also be called up from the editor, without having to reload the text to be formatted or printed.

An extensive list of error messages alerts you to mistakes. Typing Ctrl Z will

get you out of almost any predicament, and a program called Recover will attempt to restore your text in the swap file even if the computer crashes. As far as bugs are concerned, Mark of the Unicorn is confident that the bugs of version 1.0 have been corrected.

TFW'S FULL-screen editor and its ability to produce standard DOS files make it a perfect tool for programmers.

Advantages

Five outstanding features make TFW unique. One is the ability to edit and view two files simultaneously. Next, the automatic placement and numbering of footnotes, as well as the generation of an index of tagged words, greatly facilitates the preparation of complicated documents. Thirdly, the state-save feature prevents losing text, even if the system crashes. Additionally, after using TFW, you might find it difficult to go back to a program that did not permit user customization of the keyboard and the command structure. Finally, the comprehensiveness of cursor movement and deletion commands, and the simplicity of marking and moving text make TFW a first-rate word processor.

At \$300 this program may be the best total value in word processing today. And the support you get is worth even more than the price you pay. The staff at Mark of the Unicorn is constantly working on improving the program and it is very receptive to users' suggestions.

Shortcomings

Although TFW is an excellent program, the addition of several features would really make it "the final word." The features missing in version 1.1 include horizontal scrolling, column move, and soft-hyphen support (the latter in the simple print mode only). TFW also lacks variable tabs and a counter that indicates the present page and line number, which would be useful in office environments.

Advanced users who need macro capability should try a keyboard enhancer program such as ProKey by ProSoft (Box 5850, Seattle, WA 98105).

Aesthetics

TFW rates highly in aesthetics; the program is clean. Only the bottom two lines of the screen are used for program information. The first line gives a status report (including whether you are in word wrap or normal mode) and the buffer name and the file associated with it. It also indicates your approximate position in the file and whether you have modified the text since you last saved it. The bottom line is used for requests for confirmation, prompts, and error messages. TFW has no pointers in the right-hand column that indicate paragraph and ruler status: EasyWriter II and WordStar do. The screen remains clear for text. Consistent with this feature, the menu-driven editor displays on screen only when you need it.

Applications

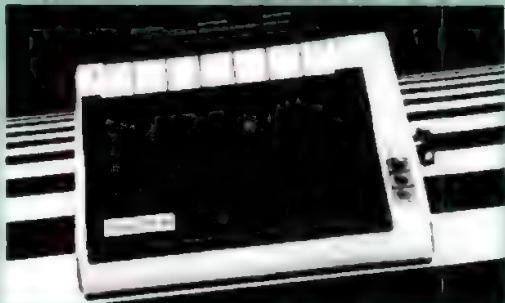
TFW is a program that is especially suited to the needs of writers, academicians, and programmers. Writers will appreciate the transparency of the editor; you don't have to change pages manually or worry about control characters cropping up in the text. Academicians can create complicated and lengthy documents complete with footnotes, tables of contents, and indexes. TFW's full-screen editor and its ability to produce standard DOS files make it a perfect tool for programmers.

Many office environments will not need the sophistication of this software package. But now that TFW sports a beginner's mode that prevents the accumulation of multiple working files in the swap file, businesses that need the power of a full-fledged word processor should carefully consider TFW.

TFW's versatility and flexibility, including its ability to interrupt work in progress without inconvenience, cannot be rivaled in today's software market. Anyone who wants a clean, efficient, and powerful word processor should take a close look at this program. /PC

Steve Siebert, a student at Yale, is currently working on his dissertation in philosophy. He spends his spare time searching for and advising others on the ultimate word processor.

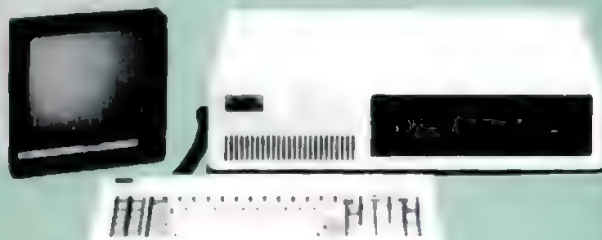
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An in-depth look at a new PC-compatible keyboard that for some users provides an appealing alternative to the IBM original.

Key Tronic's Soft Touch

KB5150 PC-Compatible Keyboard
Key Tronic Corporation
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When I first sat down at the "new" PC keyboard, I was perplexed. It looked nearly identical to the old model. A couple of light brushes across the keys and a few Caps Locks and Num Locks later, though, and I was playing a different tune. Then I noticed that the keyboard casing was missing three little letters: I, B and M.

And so began the "Case of the Mystery Keyboard," an investigation that also asked one of the critical questions of our

KEY TRONIC's
device barely
whispers its response
to your fingertips.

time: What is a "Scroll Lock" and what is it doing in the upper right-hand corner of this keyboard?

Further investigation revealed the identity of the maker of the new model: it is the KB5150 PC-compatible keyboard from Key Tronic Corporation of Spokane, Washington. The company, which claims to be the world's largest supplier of full-travel keyboards to computer manufacturers, has decided to plunge into the retail market for the first time.

Key Tronic's KB5150, named after



IBM's product number for the PC, addresses several of the annoying design quirks of the IBM original in a subtle, respectful manner. The standard IBM PC keyboard offers a positive, comfortable feel, with each key clicking reassuringly and loudly as it makes contact.

KB5150 Features

Key Tronic's device, by contrast, barely whispers its response to your fingertips. The contact point is slightly less distinct, but a speedy touch typist might be able to pick up a few extra keystrokes per minute. What's more, typing is a lot easier on the thumbs, since the KB5105 lacks the stubborn resistance of IBM's space bar.

Other subtle but valuable changes on the Key Tronic version include bright red light-emitting diodes on the Caps Lock and Num Lock keys to indicate when

those functions are engaged; a larger, more traditional typewriter return key at the end of the middle row; an ENTER key on the numeric keypad; and the return of the left shift key to its rightful place next to the Z key. (The backslash key, which IBM placed between the Z key and the shift key, has switched places with the shift key, resulting in a more conventional layout.) The Key Tronic version includes words (RETRN, SHIFT, TAB and BACK SPACE) in place of the symbols favored by IBM.

Key Tronic redesigned the keytops to make them slightly more distinct. The keyboard case, which has a small plateau at the top instead of IBM's ridge, is constructed of a high-density structural foam, according to the company. The KB5150 case weighs slightly less than the IBM keyboard but it looks and feels just as solid and substantial. And like its IBM cousin,

the KB5150 also has an adjustable footbed that can vary the angle of the keyboard. The KB5150 prototype came equipped with a rather flimsy connector cable, but

SUDDENLY
the keyboard has
become a separate
module, and someday
it may become a
peripheral.

production models will have a heavy cable like the one on the original IBM keyboard.

The Road Test

I substituted the Key Tronic keyboard for the original on my PC and used it for a full week of word processing. I learned to type on an ancient Smith Corona manual, and honed my skills in a newsroom where it was almost a point of pride to see how savagely I could pound a keyboard. I was surprised to find that I could quickly adapt to the KB5150's light touch. In fact, I came to prefer it; typing was easier and the quiet helped my concentration.

Key Tronic, by the way, cites a study by Xerox Corporation that claims a 5 percent increase in speed for its light-touch keyboard over an IBM model. For a 60 word-per-minute typist this figure would translate to 63 words per minute; a 20 word-per-minute hunt-and-peck typist would increase to 21 words. This isn't a tremendous increase, but to skilled typists, every improvement counts.

The Keyboard Market

Hundreds of thousands of IBM PCs are being used with the original keyboard in place. In fact, IBM does not sell PCs without factory keyboards. Does Key Tronic expect owners of PCs to forget about their perfectly usable factory keyboards and run out and buy its new model?

"Not all of them," said Key Tronic marketing manager Mark Tiddens. "A small market exists out there, maybe 5 to 10 percent, for whom this product will make a difference. These are people who do

enough typing to justify the purchase of a new keyboard."

Until now, all of Key Tronic's sales have been bare boards—electronic and mechanical parts without a case—sold to computer manufacturers. "This is the first time that keyboards have ever been of such interest to people," Tiddens added. "All of a sudden the keyboard has become a separate module, and someday it may become a peripheral."

For the immediate future, the Key Tronic Corporation expects a steady demand from buyers of PC-clone personal computers. A version of the KB5150 is now the standard keyboard on the Columbia Data Systems PC-clone and similar versions may turn up with other systems soon. The company also plans to market keyboards for several other computers, including the Apple II and the DEC 100.

KB5150 production lines were running at 5,000 per month in October for PCs and PC-clones. Tiddens expects the company to be producing 20,000 keyboards per month by the spring of 1983.

The Key Tronic Touch

Key Tronic and its client computer makers recognize the IBM PC keyboard as a "state of the art layout." The principal difference between the Key Tronic keyboard and the IBM original is the "tactile feel," a redundancy that simply means "touch."

The Key Tronic keyboard uses a very light spring under its keycaps. According to Tiddens, the company has lowered spring resistance on most of its products from 3 ounces to 1.5 ounces. "This is a popular trend," Tiddens related, "but right now we can't go any further without affecting reliability because of the mass of the keytop."

The design of the switches in the Key Tronic keyboard also differs from IBM's version. IBM uses what engineers call a "breakover tactile feel." The user can feel the pressure building up to the point of operation. Then the pressure drops, "breaks over" the operation-threshold point, and decreases at the end.

The breakover feel recalls the touch of a mechanical typewriter from which it is descended. Typewriters with levers beneath the keys and striking elements at the end of moving arms utilize the build-up and release touch. IBM chose to maintain

that feel in the design of its electric typewriters and computer keyboards.

Key Tronic uses a "positive force tactile feel." When the key is depressed the pressure remains until the moment of contact.

The Switching Effect

The popularity of the IBM and its keyboard marks another step away from the magnetic switches used in many other keyboards. Magnetic designs include the reed switch, in which a magnet attached to the descender of the key makes or breaks contact in a sensitive switch; the Hall Effect switch, which makes contact when a magnet passes near a semiconductor; and the saturated-core inductive switch, in which a magnet passing by a coil of wire generates a small amount of current.

Both the IBM and the Key Tronic keyboards apply the latest developments in capacitance switch technology. Two charged plates separated by an insulator are brought close together by depressing the keycap. As they reach their closest point, a change in the charge sends a signal acknowledging that the key has been pressed. IBM uses a hard plate, which contributes to its breakover feel; Key Tronic uses a foam pad with aluminized mylar that accounts for its softer feel.

THE PRINCIPAL
difference between
the Key Tronic
keyboard and the
IBM original is the
"tactile feel."

The industry is opting for capacitance switches primarily because they are about 30 percent cheaper to manufacture. This savings contributes to the overall decrease in the prices of keyboards and computers.

One problem with electric and electronic keyboards has been the bounce factor, the tendency of some keyboards to produce double (or more) letters from an over-exuberant keystroke. Both the IBM and Key Tronic keyboards approach this problem in two ways: the design of the switches and error-correcting electronics

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in the keyboard. The keyboard is told to ignore signals that come too close together as these could only be the result of an error and not a deliberate signal by the typist.

The KB5150 includes a 2K ROM (Read Only Memory) chip that provides the board with error recognition procedures. The single 8048 ROM was specially designed for the KB5150 by Key Tronic.

Keyboard Language

The IBM PC also marks an advance in the way a keyboard communicates with the computer. Instead of generating standard ASCII codes, which are interpreted directly by a computer's character generator for display on a video screen, the PC's design calls for the keyboard to generate a unique code—one on depression and one on release—for each key. This feature allows the computer's interpretation of the keyboard to be changed with software. The possibilities include the assignment of any key to any position, or the use of special keyboard layouts including ones that don't rely on the much-maligned QWERTY arrangement, or ones using special symbols or foreign language keys.

The Strange History of QWERTY

QWERTY refers to the standard keyboard layout, in which the top row of letters on the left side spells "QWERTY."

**A GENERATION
of computer users has
been forced to live
with the nonstandard
keyboards foisted
upon them.**

The idea of changing the design of the standard typewriter keyboard has been a subject of controversy for almost as long as the typewriter itself has been on the scene.

QWERTY resulted from two deficiencies in one of the original typewriter designs. The first machines were laid out with the keys in strict alphabetical order. One problem with that arrangement was that the most often used letters were not

necessarily the most accessible. Second, some of the important letters were so close together that any typist working at a reasonable rate of speed would continually jam the keys. QWERTY was unveiled in 1872 to deliberately slow down typists in an effort to prevent jammed keys. It has remained ever since, despite evidence that other layouts would greatly speed the typing process with modern machines.

And so a generation of computer users has been forced to live with some of the nonstandard keyboards foisted upon them by manufacturers, most notably the non-shifting unmodified Apple II keyboard and other mutations. "It's a dangerous thing to play around with the typewriter layout," Tiddens observed. "Computer manufacturers have already found out that they have to give people the familiar typewriter layout, putting shift keys and backspaces where people are accustomed to finding them. The PC's arrangement of the Num Lock and Caps Lock is somewhat confusing, but the idea to alternate between the cursor pad and number pad for different users is something new. The Key Tronic keyboard retains both these features."

Function Keys

Some users have complained about the placement of the ten function keys on the IBM PC (and Key Tronic) devices, preferring to see them at the top of the keyboard. Tiddens noted, however, that IBM's design keeps the keyboard from looking quite so massive, in line with the trend for lightweight and light-looking keyboards.

One alternative that might offer a compromise would be to redesign the function keys as flat membrane or panel keyboards, such as those used on the Atari 400, other low-end consumer computers and games, and on some printer controls. These alternative designs could easily serve for tasks that are needed only occasionally, such as line spacing. Unfortunately, the membrane keyboards (also called screen-contact) do not lend themselves to speed. But they do have other advantages, such as low cost and imperviousness to water and dirt.

An area where design changes are already under way is in the keyboard's dimensions. "When the keyboard was invented," Tiddens remarked, "someone must have taken all of his friends and

measured their fingers and come up with an average of 3/4 inch for the distance between key centers. That has become standard and never questioned. In Europe they are trying to reduce key centers from .75 to .60 of an inch to reduce cost, as well as for design and portability considerations." Tiddens did not venture a guess as to whether that trend would extend to Key Tronic and the U.S. market.

The European interest in ergonomic standards—design considerations that emphasize user comfort—has already crossed the Atlantic. Many countries in Europe, led by Germany with its DIN standards, now require that keyboards be lower to the desktop, separated from the com-

**IT'S A
dangerous thing to
play around with the
typewriter layout.**

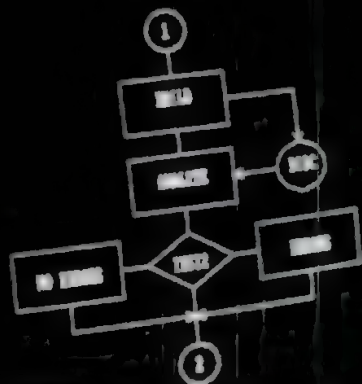
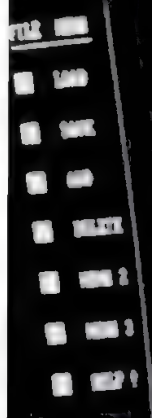
puter, and marked with nonglare keytops. The DIN standards state that the top of the desk to the top of home row—the center row of the keyboard—can be no more than 30mm (1.2 inches) with the keyboard placed at up to an 11 degree angle. Both the IBM and the Key Tronic devices meet these standards.

The Key Question

So, the question becomes, "Should you buy a new replacement keyboard for your new IBM PC?" It is difficult to say whether one keyboard is better than the other. Each keyboard is very different in feel and similar in features and appearances. Both do the same job; they transmit words from fingertips to the computer. The KB5150 will appeal to those users who would find its softer touch and extra features a worthwhile investment.

Oh, yes. About the "Scroll Lock" key on the IBM PC keyboard: Used with the Ctrl key, it is modified to serve as a break when using a BASIC program. But by itself, IBM's "Guide to Operations" will only say it is an "inactive key."

"What is it for?" Key Tronic's expert was asked. "I don't know," Tiddens answered. "But we put it on ours, too." /PC



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If you've written a program, it may be time to think about incorporating, or forming a legal partnership, or . . .

Out Of The Garage And Into The Corporation

There is no single, correct business entity for software companies, whether they are already established or about to start up. The choice depends on three considerations: business, legal, and tax. If you are a software writer interested in the legal possibilities of manufacturing, distributing, or consulting, you should ask yourself a series of questions relating to each consideration. How fast do you want your company to grow? Are you willing to sell off pieces of the business in order to raise money? Do you hate paperwork?

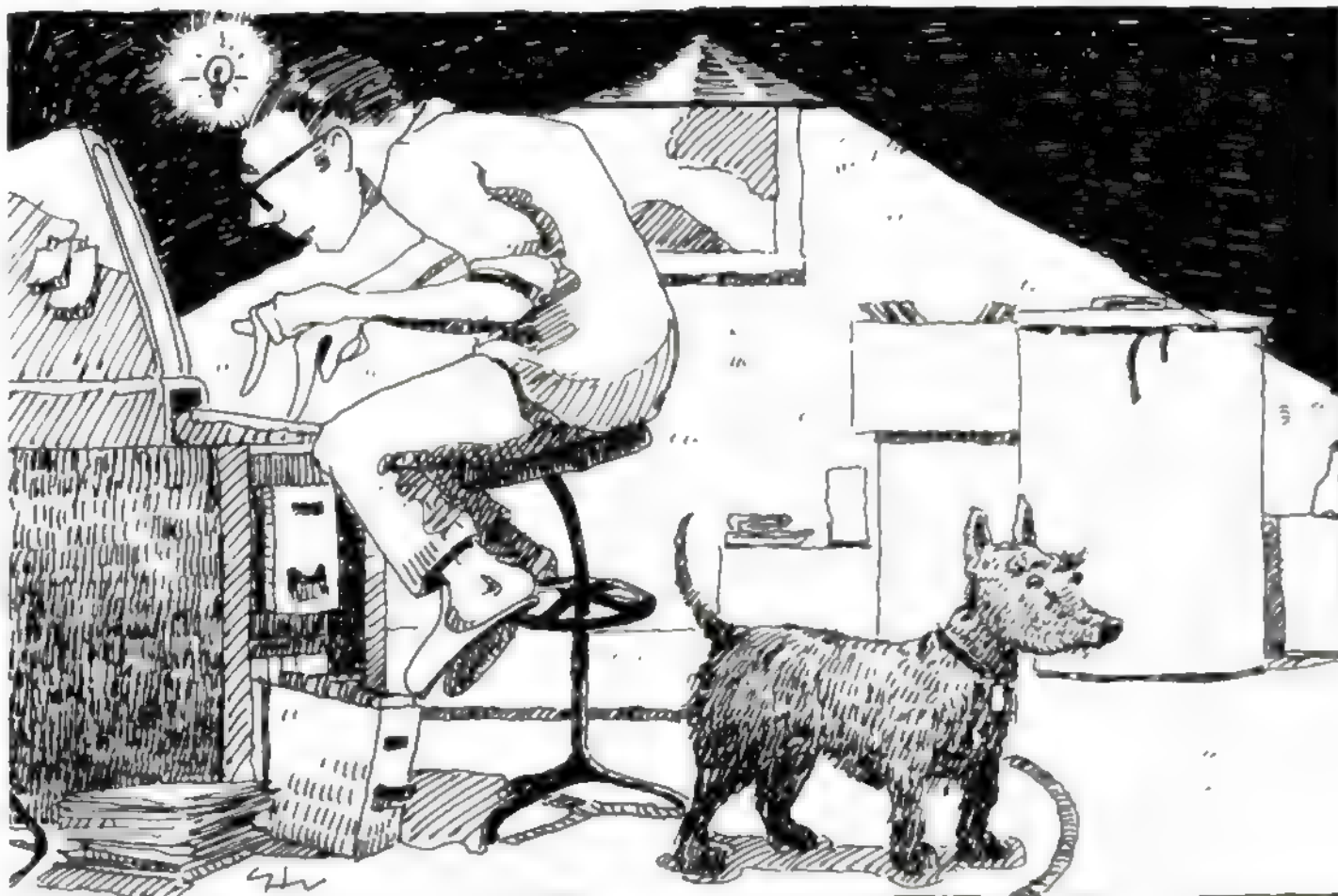
Who bears the risks of failure and benefits from the company's success? What are your potential problems should there be a lawsuit or business failure? What relationship do the owners have to each other? These are legal questions which must be answered.

Tax considerations may ultimately decide which business form to take. How will income, losses, tax credits, and deductions be used to benefit the owner(s)? In the software field, the wrong tax decision may have tragic consequences because, under certain conditions, royalty income can be subject to a 70 percent tax.

Deciding how to organize your business requires careful analysis of your responses to the questions posed above. To make a good decision, you may have to get legal and tax advice.

For example, a corporation protects its owners from personal responsibility if the corporation finds itself in legal difficulty. But a limited partnership and the right insurance can achieve similar results.

There are other cases of one business form taking on the character of another. For example, a partnership ordinarily ceases to exist when a partner dies, even if there are several partners left. Corpora-



tions, on the other hand, theoretically live on even if a large stockholder dies. With the right agreement, a partnership can achieve much the same sort of immortality that corporations enjoy, even after the death of a partner.

Sole Proprietorships

The sole proprietorship is the easiest business entity to create. By definition, it has only one owner. The owner simply starts doing business. He or she will have to satisfy local requirements. Depending on the city, county, and state, these may include city business licenses, use permits, resale numbers, fictitious name filings, workers compensation insurance, and so on.

In addition, sole proprietors have to file federal and possibly state employee tax returns. It might seem a bit overwhelming to

get all of this squared away. However, it shouldn't take more than a day or two to obtain the necessary applications and to request the appropriate tax returns. The other two business entities, partnerships and corporations, both require somewhat more paperwork and trouble.

What are the business reasons for not choosing to organize as a sole proprietorship? While setting up and operating is easy, a sole proprietorship can be a problem if you want to add more owners and money to the business. Suppose you want to give a key employee some equity (an ownership position). If you give up part of the company, you'll have to change your business to either a partnership or corporation. But there are other ways to reward key employees short of giving up part of the company. You might set up a profit-sharing plan that gives the employee a per-



centage of the profits while leaving you as the sole owner.

How does a sole proprietorship affect a company's ability to raise money? As a sole proprietor you may have to borrow. A potential investor will certainly want you to change your company into a corporation or partnership in return for investing in the business.

However, if you want to expand by adding capital or owners, you may have to change your business entity. Often this can be done without tax consequences, but there can be delays while the filing and paperwork is being done. Thus, if your business plan calls for rapid expansion, a sole proprietorship is not the business entity for you. If, however, the business is small and is likely to remain so for a long time, there are no business reasons for not starting out as a sole proprietorship.

The law recognizes no difference between the owner of a sole proprietorship and the business itself; they are one and the same. This means that all legal risks are borne by both the business and the owner personally. If your business is sued by an irate customer who bought your bug-ridden payroll program, your personal assets are at risk should the suit be successful. If the business incurs debts, you will be personally responsible for them. If the business fails, you will have to pay the creditors or have your assets subject to attachment.

Some of these legal considerations can be covered by adequate insurance. In general, the sole proprietor is personally responsible for the business and must bear the risk of something going awry.

From a tax standpoint, the sole proprietor faces the same situation he or she faced from a legal standpoint. The government looks at the business and the owner as the same person. This may or may not be an advantage. If the company is losing money, the owner can use that loss to offset income from another source. Similarly, if the business is entitled to tax credits, the owner directly benefits by subtracting the credit amounts from the actual taxes due.

The most important tax problem has to do with business expansion. If you plan to use business profits to expand your company, you will, as a sole proprietor, have to pay taxes on any profits realized by the end of the year. Then that taxed money can be reinvested in the company. If your tax bracket is low, this might not be a problem, but if it is high, you might be better off incorporating.

Partnerships

A partnership involves at least two

partners and resembles a sole proprietorship in several respects. Like sole proprietorships, partnerships are easy to set up. Everything that you do as a sole owner (business licenses, etc.) must be done in partnership, plus you need to draw up a partnership agreement. This agreement spells out the rules under which the partnership operates, including how profits and losses are to be split, what happens if a partner dies or wants to leave, what each partner's contribution in time and money will be, and so on. There are various books on how to set up your own partnership. The rules and requirements vary from state to state.

Sometimes it's an advantage to have a partnership dissolve when a partner dies or quits. But if you want to keep the partnership alive, the partnership agreement should say so and should specify under what terms.

A partnership is workable for a few people, but if you want to bring in additional partners, you must form a new partnership unless the agreement specifies otherwise.

From a liability standpoint, each partner is personally at risk. As in a sole proprietorship, the owner's personal assets can be seized by creditors, and legal awards can be satisfied by proceeding directly against the partners. In addition, if a partner has a judgment against him or her personally, the creditor will ultimately be able to proceed against the partnership.

Another legal consideration is that each partner can bind the partnership. This means that the entire partnership, including the partners as individuals, will be liable for the poor or dishonest business decisions of any other partner. For example, suppose you and your partner had a

disagreement about whether your software development company needed a new hard disk. You could buy the disk even though your partner didn't want it. If the disk seller didn't know of the disagreement, the partnership, as well as you and your partner as individuals, would be liable to pay for it.

The situation could even be worse. One partner could be dishonest and order equipment for his own use. As long as he bought it in the name of the partnership, all the partners would be liable. Of course, the honest partners would have a legal cause of action against the thief, but this isn't much consolation when you're trying to run a business.

For tax purposes, the partnership is required to file an informational return. This means that the partnership's income and expenses must be listed, but no taxes are charged to the partnership. Instead, to each partner is attributed his or her share of the profits (or losses), and the partner pays the taxes on his or her own personal tax return.

For example, suppose Sue and Tom are partners in a software publishing company. Their partnership agreement states that Sue gets 70 percent of the profits and Tom 30 percent. If the company had a net profit of \$10 thousand, Tom would be taxed on \$3 thousand and Sue on \$7 thousand. Similarly, if the partnership bought a

penses—health plans, for example—are probably not in themselves large enough to warrant avoiding the partnership form.

Limited Partnerships

A limited partnership offers certain protections against liability that normally are associated with corporations. A limited partnership consists of at least one general partner and at least one limited partner. The general partners manage and run the business. The limited partners are investors. They contribute money to the partnership in return for a share in the profits and equity. The limited partners do not, however, have a say in how the company is managed. If they take an active role in the business, they stand to lose their protected status as limited partners and would become general partners, once again vulnerable to personal liability.

Since limited partners are protected from the business risks that the general partners assume, they can lose no more than the money or promissory notes that they invested in the partnership. This is one reason why limited partnerships are popular in financing the development of software. These limited partnerships are sometimes known as research and development (R&D) limited partnerships.

To use a hypothetical example of an R&D limited partnership, Firstware, a software developer, needs money for developing a new fifth generation word processor. Firstware can borrow the money or sell some of its stock. Or it can set up an R&D limited partnership. If Firstware borrows money, it faces the bleak prospect of having to pay it back on time. Selling stock means that the Firstware stockholders lose control of their company. The R&D limited partnership circumvents these disadvantages.

R&D limited partnership agreements are highly technical. This is not an area to dabble in. If you want to form your own limited partnership, see an expert.

Corporations

Unlike sole proprietorships and partnerships, corporations are, in the eyes of the law, separate from their stockholders or owners. The law favors corporations. As a result the corporate entity is a favorite among medium and large businesses.

A corporation can be owned by one or more shareholders. Its structure is flexible

and allows for the easy addition and subtraction of more shareholders or investors. It has a legal life of its own. For various reasons (often psychological), banks and other corporations seem more comfortable dealing with fellow corporations than with the other business forms. Corporations also involve somewhat more paper-

LIKE SOLE proprietorships, partnerships are easy to set up.

work, legal work, and accounting.

From a legal standpoint, the most important feature of a corporation is that it limits the potential of personal liability on the part of its owners (shareholders). This means that the owners' personal assets will be safe from creditors of the corporation. If, for example, your corporation should leave its bank loan unpaid, you would not have to pay off the corporation's loan from your personal assets.

The advantage of limited liability, however, is not as good as it sounds. Most creditors—especially banks—will not lend money to small corporations unless the owners obligate themselves personally to the loan agreement. The same usually applies to landlords and other sophisticated business people. Companies that you buy from on an open account, however, often do not require your personal guarantee, thus giving you some degree of limited liability. Naturally, it is considered fraudulent to incorporate for the purpose of running up bills with the intention of avoiding payment.

If you want limited liability, you must adhere to the formalities associated with ownership of a corporation. These formalities involve, among other things, holding board meetings with written minutes. This doesn't seem like much—and it isn't—but many corporations tend to put off the formalities and run the risk of losing their corporate protection.

Perhaps the most important considerations when deciding whether to incorporate relate to tax laws. Normally, the corporation is a tax-paying entity. Corporate

A CORPORATION allows for the easy addition and subtraction of more shareholders or investors.

\$10 thousand computer and was eligible for a \$1 thousand investment tax credit. Tom would be able to subtract \$3 hundred from the taxes he owes and Sue would subtract \$7 hundred.

Sole proprietorships and partnerships cannot deduct certain expenses that corporations are allowed to deduct. These ex-

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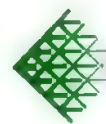
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tax rates range up to nearly 50 percent. Depending on your personal tax bracket, the corporate tax can be less than the tax on your personal income. This means that if you need money for company expansion, it can be better to keep it in the corporation, let it be taxed at the lower rate, and then invest it in expansion. The alternative would be to pay out the corporate earnings to the stockholders and employees in the form of either dividends, wages, or bonuses. The people receiving the earnings would then have to pay taxes.

The way to avoid double taxation is to keep the earnings needed for expansion in the corporation and pay out the rest to the shareholders. If the shareholders are employees, the payments should generally be in the form of wages, which are then tax deductible to the corporation. If the company is wildly successful, after a certain salary level, the IRS will begin to view a shareholder's "salary" as a dividend, subject to corporate and personal taxation.

If your corporation is held only by a few individuals, again depending on everyone's tax brackets, you may be able to plan

salaries and the taxable income of the corporation in such a way that they fall into the lower tax brackets on both corporate

LIMITED *partnerships are popular in financing the development of software.*

and individual tax returns. The IRS will look hard at any wild apportioning of income, but as long as the salaries and the amount of money kept in the corporation for future expansion are reasonable, there shouldn't be problems.

One tax disadvantage of owning a corporation is that normally, if the company loses money one year, that tax loss must be counted against company profits the next year (or against a company profit the year

before). With a partnership or sole proprietorship, however, the company's loss is passed directly through to the owners and they can use the loss to offset any other personal income (or spouse's income).

The Subchapter S corporation allows the owners to be taxed as if they were a partnership. The corporation still enjoys the regular corporate benefits such as limited liability. Thus, subchapter S corporations can have their cake and eat it too.

When the company begins to make money, the corporation can drop its Subchapter S status, becoming a regular corporation able to benefit from the lower corporate tax rate.

The final choice of business entities will have to be made by carefully analyzing your business, legal, and tax situations. Setting up your own business is fairly easy—even if you choose to incorporate. However, if you are in the software business, due to the various special tax considerations, I would advise anyone interested in incorporating to see a tax expert first. The money spent will be a good investment. /PC

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What every program writer, manufacturer, and aspiring manufacturer should know about loopholes in software tax and accounting rules.

Avoiding The Tax Byte

Experts predict that software production will be the fastest-growing industry of the 1980s. Thousands of companies are now in the business of developing software for sale, and thousands more develop or purchase software for in-house use. The development and/or acquisition of software has become an important factor shaping the financial statements and tax returns of companies that in many cases consist of no more than an inspired individual or small groups of programmers.

Tax and accounting rules allow some flexibility in figuring software costs. The treatment of software costs often makes the difference between a profit or a loss. Accounting and tax rules governing the computer software industry rival the intricate circuits of a microprocessor in complexity. This article provides an overview of the complicated, highly technical tax laws pertaining to software development. Creative applications of the rules will be increasingly important for companies and individuals involved in this burgeoning industry.

When accounting for software costs, a company must determine when the costs should be assigned to a capital assets account (capitalized) and when they should be considered direct expenses (expensed). Generally, capitalization of costs makes a company's financial statement look stronger, but at tax time it can deduct only a fraction of the software cost as amortization expense. If the costs are expensed, however, the full cost of software may be

deducted from taxable income as an operating expense, but such expenses weaken the financial statement.

Fortunately, tax rules for software development are independent of financial accounting rules; consequently, the same costs may be classified as assets on a financial statement and deducted as an expense on income taxes. A careful—and creative—classification of software costs enables a company to take advantage of flexibility in the rules.

T**HE TREATMENT**
of software costs often
makes the difference
between a profit
or a loss.

Software companies should analyze projected tax brackets to determine whether to make deductions in the present or to capitalize and defer deductions. The results of their analyses will vary according to the taxpayer's financial and filing status. A company in its start-up phase would probably capitalize its first year's software development costs (when there is little or no profit to offset) and amortize (spread into equal segments) the costs over the period that the developed product is

expected to sell. A software company in the maximum tax bracket would probably benefit most from expensing research and development (R&D) costs. Such a company would want to offset current taxable income by deducting the software development costs as they are incurred.

In-house Software Development

Financial and tax accounting rules require a distinction between internally-developed and externally-developed (purchased) software. Internally-developed software includes programs written for sale to other firms. Under Generally Accepted Accounting Principles (GAAP), the standard for the industry, R&D must be expensed as incurred. This means simply that companies are required to list research and development as expenses on their financial statements.

The cost of developing software that will be used solely for a company's internal R&D activities are clearly categorized as R&D, and should be expensed. The question becomes, "What is considered R&D under current tax law?" Generally,



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R&D includes the cost of developing a new product intended for sale or lease, or the cost of making a significant improvement to such an existing product. R&D expenses can include direct materials and supplies, salaries and wages, contract services, and a reasonable allocation of indirect costs.

GAAP favors expensing software development costs because the accounting profession has decided that the benefits of

that markets software originally developed for in-house use is not immediately evident. There are often more gray areas than clear-cut choices. Creatively classifying costs can be beneficial.

Taxes and In-house Software

Income tax treatment of software development costs is much more flexible than that of GAAP. However, Internal Revenue Service (IRS) laws are just as complex. The IRS has ruled that taxpayers may treat the cost of self-developed software as R&D cost, whether or not the software is used by the taxpayer, held for sale, or leased to others.

Under Section 174 of the IRS Code, R&D costs must be treated consistently. That is, they must be expensed—deducted—as they are incurred, or capitalized as deferred expenditures. Deferred expenditures are recoverable by amortization—expense tax deductions spread over the useful life of the software. The period of amortization is at least 60 months, beginning with the month in which benefits are first realized from use of the software. If a company can clearly establish a shorter useful life of its products, it may amortize deductions over a correspondingly shorter period. Shorter amortization is desirable because it accelerates recovery of expenses. The shorter the amortization period, the larger the deduction in each tax year.

A software company is not bound by law to either capitalization or expensing. It may decide between the two on a project-by-project basis. Thus, R&D costs of Project A may be consistently capitalized while similar costs on Project B are consistently expensed.

To expense costs, a company need only claim deductions on its income tax return for the first year in which the R&D costs are paid or incurred. To capitalize and defer R&D costs, the company would attach a statement to the return for the first taxable year for which the decision to capitalize is to apply. If the company has consistently deferred and amortized the software development costs of all projects, a failure to file this statement would probably not result in an IRS demand that such expenses be deducted immediately.

A software company might choose to capitalize for tax purposes the same development costs it must expense under

Accounting and tax rules governing the computer software industry rival the intricate circuits of a microprocessor in complexity.

capitalization are unpredictable. In other words, the cost—or expense—of developing software should be entered as an expense in the same year the software is developed. Accountants maintain that it's too difficult to demonstrate a direct relationship between software development costs and specific future revenue. The conservative nature of GAAP prevents capitalization of intangible (future) assets of undetermined worth on the balance sheet. Capitalization of software R&D costs simply requires too much guessing.

Despite the strong bias toward expensing, there are still many exceptions by which capitalization of software would be appropriate, or at least defensible. Routine or ongoing development efforts to improve an existing software product or adapt a product to a specific customer's need would not be considered R&D. The cost of developing software for in-house administration or for marketing would likewise not be considered R&D. These costs should be assigned to an asset account when they are incurred and then charged to an amortization expense account over the useful life of the system.

Many transactions do not fit neatly into any of these categories. For example, the proper accounting treatment for a firm

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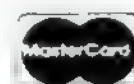
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CIRCLE 174 ON READER SERVICE CARD

GAAP. A firm that develops software for its own use could likewise expense for tax purposes the same costs it must capitalize under GAAP. Companies developing software both for sale and internal use, those developing more than one product at the same time, or those involved in ongoing maintenance and adaptation of existing software have even more flexibility in treating costs.

Purchased Software

The tax and accounting rules for purchased (externally developed) software are almost the opposite of the rules for self-developed software. Under GAAP, costs of purchased software are considered R&D only if the software is used directly for research and has no alternative future use. All other purchased software should be capitalized and amortized over its estimated useful life. GAAP considers most software purchase costs as long-term assets of the purchaser rather than immediate expenses.

Since purchased software is treated more favorably under GAAP, many software development firms have entered into creative arrangements to recast development costs as purchase costs. One of these arrangements involves organizing separate limited partnerships to undertake the development activities. The limited partners contribute the capital and take advantage of the income tax deductions as development costs are incurred. When the software is fully developed, the organizing company purchases the product from the partnership. Consequently, the organizing company can capitalize the cost of the purchased software on its balance sheet. The individual partners in the limited partnership obtain favorable tax treatment on the sale of the completed software and could receive royalties from future sales.

The accounting profession and the Securities and Exchange Commission (SEC) have both proposed rules to govern limited partnership arrangements, which they consider financing activities. The rules are complex and should be studied closely by companies involved in these kinds of transactions. When the software company retains the risk of the R&D activity, it must estimate the liability resulting from the transaction and consider it as borrowing or debt on its balance sheet. The liability effectively offsets any asset realized from

the arrangement.

For income tax purposes, costs associated with purchased software must be deferred and amortized over the useful life of the software (or 5 years). If the cost of purchased software is included (and not stated separately) in the price of pur-

***THE SHORTER
the amortization
period, the larger
the deduction in
each tax year.***

chased hardware, then the entire cost would be capitalized and recovered through depreciation deductions. While the useful life of equipment such as computer hardware has been set by statute at 5 years, a useful life of 3 years can be claimed for equipment used for R&D. Further, when software cost is tied to the cost of hardware, the full 10 percent investment tax credit (ITC) applies to the cost of the entire package. Intangible assets, such as software, are amortized. Depreciation applies to tangible assets, such as computer hardware. The Economic Recovery Tax Act of 1981 allows tangible assets to be depreciated in uneven segments by a method called Accelerated Cost Recovery System. Therefore, it is often better to treat software costs as part of the hardware system because equipment depreciation deductions are generally larger and more effectively distributed.

The IRS permits a current deduction for purchased software in some cases. If the software company contracts with another company or individual to provide it with programming systems and services, and if the company bears the risk of the software's usefulness, it can deduct these costs when they relate to software R&D.

Leased Software

A software company will normally deduct software lease payments when they are made. However, it may elect to deduct or amortize these costs to be consistent with its practice as a software developer. The company's role as a developer can be

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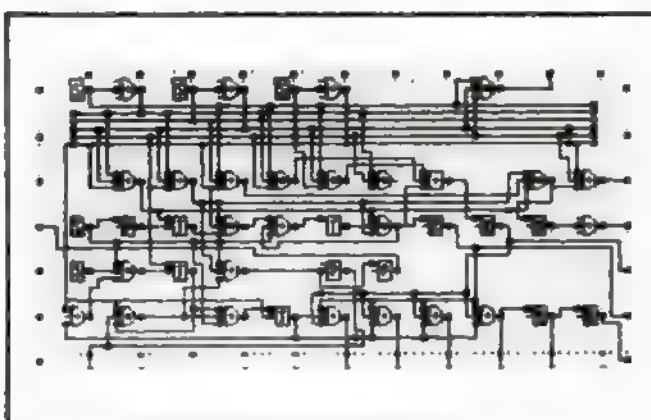
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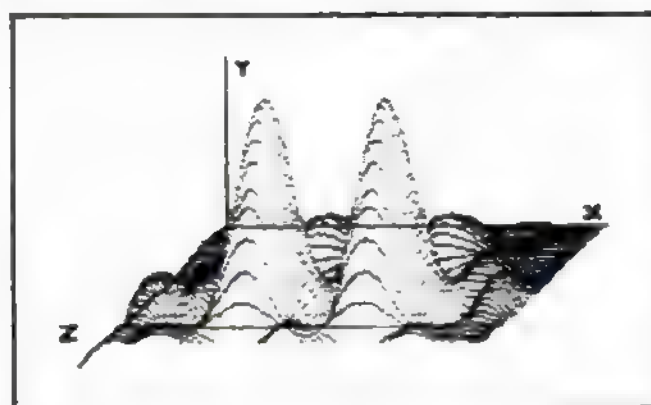
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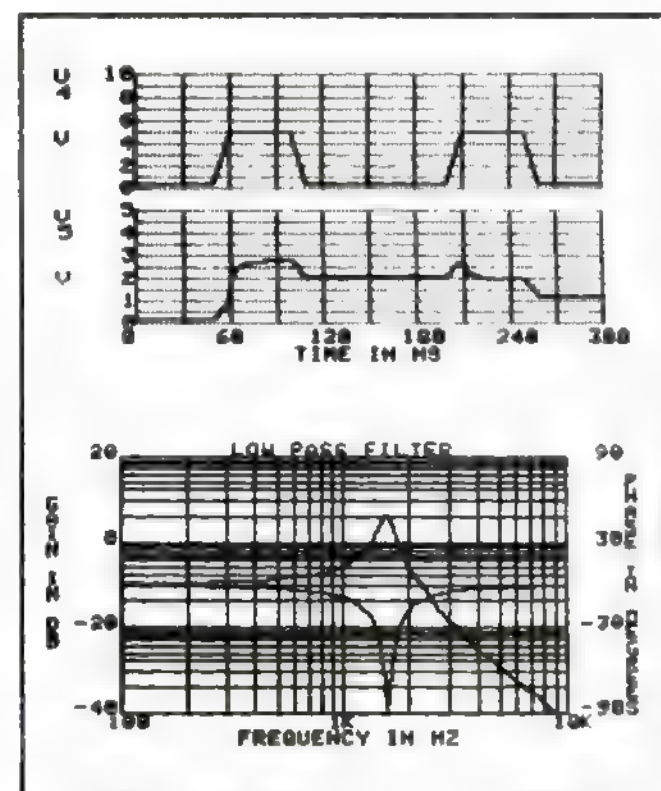


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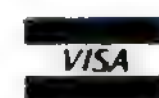
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To be semi-technical about it, ProKey is a full-time, on-line macro processor. It is loaded into the PC RAM at boot-up, and remains resident under almost any other program that follows.

The bare program takes up about 7K RAM; defining about 20 special keys in-

creases RAM consumption to about 12K. There is no mention in the ProKey manual of memory requirements. Obviously, though, if you are working with a PC with minimal memory (64K or less), ProKey will eat into your machine's thinking room.

According to its author, ProKey should work with any program loaded in the ordinary manner under PC-DOS. For purposes of this review, ProKey was tested with WordStar, MultiMate, VisiCalc, and BASIC on a PC with 128K RAM and two double-sided disk drives.

The most immediately obvious use of the program is with word processors. For some programs ProKey might be an undiscovered necessity.

Consider a few of the odd choices made by MicroPro programmers when they adapted WordStar from its original CP/M version to run on the PC. They took a look at the ten lovely function keys, just begging to be of assistance. What did they do? Four of the ten went to some of the least common functions (set left margin, set right margin, paragraph tab and remove menu control.) Two other keys were assigned with a maddeningly perverse logic. "Go to beginning of copy" was given to F10, the last function key; "Go to end of copy" was given to F9. And then the WordStar programmers stopped. Ten assignments only, out of 93 possibilities.

Oh, yes, they also made the Del key into a strange command that removes a character to the right of the cursor position, instead of directly above the cursor as some would prefer.

Worst of all, for most users of WordStar, there was no way around the prob-

lem. The code was protected and inaccessible. MicroPro does offer, for a considerable additional charge, a version that can be modified.

Enter ProKey. In about 10 minutes, I was able to write a "script" of 25 special characters designed specifically for my needs and writing style. Then I added the script and the ProKey program to an AUTOEXEC.BAT file on a WordStar disk. Now, when I boot up the program, I have the world's only "WordStar by MicroPro as Adapted and Corrected by Sandler With the Help of ProKey" (See Figure 1).

I began by changing around the F9 and F10 function keys so that they are logical—at least to me. F9 takes me to the beginning of copy and F10 to the end.

I also changed the F1 function key so that I can automatically set up a new WordStar program in the format I use most often. Punching the key once eliminates editing menus, toggles off justification, shuts off the auto-hyphenation control, and sets printing and display to double spacing. While I was at it, I made Alt F1 into a separate toggle for justification, and Ctrl F1 as the command for single spacing.

I also added four different commands to the F2 key. F2 alone saves the current copy and returns to the original cursor position; Alt F2 saves copy and exits to the program's main menu; Ctrl F2 bombs out of a file without saving it, pausing for an "Are You Sure?" Y/N (Yes/No) question. I made SHIFT F2 into a "Super" command; it saves the current copy, calls up the WordStar print menu, automatically inserts the name of the file just saved, types in my preselected answers to the questions

on printing requirements, and then starts the printer.

And I changed the Del key to suit my definition rather than MicroPro's. I also added a special definition of Alt P that types "ProKey" whenever I call upon it. Finally, I added two sets of commands that deal with the common word processor problem of forgetting to end an underline or boldface command. Now when I type Alt F3, I get an open underscore command. I can then enter as much copy as I like under the underscore command. When I'm through, I just tap the Return

key and a close underscore command is automatically entered into my text.

Getting Started

The program comes on a single-sided 5¼-inch disk. Interestingly, ProSoft chose to include three identical copies of the file on the disk: PROKEY.EXE, PROKEY.EX1, and PROKEY.EX2. The instruction manual explains that the extra versions are protection against receiving a bad copy on the disk you buy.

The program is not copy-protected and the manual advises you to make back-up

copies. The manual itself is a bit uneven. The sections on embedded commands and fixed and variable-length fields seem unnecessarily complex.

The disk includes a well-presented interactive demonstration of the uses of ProKey, taking the user through hands-on instruction within BASIC, WordStar, and VisiCalc. You'll need to have these programs available for the tour. ProSoft would do well to concentrate on the demonstration program to augment some of the weak points of the manual.

Naming Your Keys

You can assign special functions or strings of characters to any of the following:

- Alt with any letter or digit
- Any function key (F1-F10)
- Alt with any function key
- Ctrl with any function key
- Shift with any function key
- Shift with Tab
- The numeric keypad keys of Home, End, PgUp, PgDn
- Ctrl with Home, End, PgUp, PgDn
- The four directional arrow keys
- Ctrl with right or left arrow
- Ins or Del

ProKey allows you to define keys as a string from one keystroke to 1,009 characters—about 200 words if you choose to store copy rather than commands. You can store as many files of special keys as you like, changing or merging them as needed. For example, one disk could contain the ProKey program plus files of special commands for a word processor, a spreadsheet, and a game program.

To begin the process of defining a character, press Alt and the = key. At this point, the ordinary cursor of most DOS-based programs jumps up half a space to indicate ProKey is ready to record a command.

The next keystroke is the name of the key to be defined. You follow with the characters or special commands you are assigning. The final step is to press the Alt key and the = character to end recording.

Let's say you have a long document in which you have to type the name of this publication regularly. To assign a phrase to the Ctrl P combination, you strike the = key (the cursor moves up half a line).

Then strike Ctrl and the P key (this identifies the name of the new character).

Figure 1. WordStar by MicroPro as adapted and corrected by Sandler, with the help of ProKey.

KEYS	ACTION
F1	Eliminate menus, toggle off justification, toggle off auto-hyphenation, set printing and display to double-space
Alt F1	Toggle justification on/off
Ctrl F1	Set printing and display to single-space
F2	Save copy and return to original cursor position (Ctrl KS, Ctrl QP)
Alt F2	Save copy and exit (Ctrl KD)
Ctrl F2	Exit and do not save, with safety Y/N question (Ctrl KQ)
Shift F2	SUPER COMMAND: Save copy, call up print menu, auto insert of name of previously edited file, answer all print menu questions with default values and commence printing. (Ctrl KD, P, Ctrl R, Y/RETURN)
F3	Underscore
Alt F3	Open underscore, accept input, close underscore after Return key is struck
Ctrl F3	Center previous copy
F4	Boldface
Alt F4	Open boldface, accept input, close boldface after Return key is struck
F5	Reform paragraph (Ctrl B)
Alt F5	Continuous reform of paragraphs, to end (Ctrl QQB)
F6	 Beginning block marker
Alt F6	<K> Ending block marker
F7	Move block
Alt F7	Delete block
F8	Reserved
F9	Go to beginning of copy (Ctrl QR)
Alt F9	Type my address, accept input of date, type salutation
F10	Go to end of copy (Ctrl QC)
Alt F10	Type address, flush right
Ctrl F10	Type address, flush left
Del	Delete character directly above cursor

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Finally, strike Alt (the cursor drops back down to its normal position, and the character has been redefined). The same process is used to define a function key or other character so it will perform a specific task, such as storing a file or sending a command.

PROKEY *allows you to define keys as a string from one keystroke to 1,009 characters.*

But the fanciest tricks of ProKey involve nesting of variable- or fixed-length strings within a command. For example, you could create your own set of fill-in-

the-blanks commands for writing a BASIC program, as in an "IF... THEN... ELSE statement":

Press Alt and then the = key to begin recording a new command.

Press Alt and then the E key as the name of the special character.

Type IF and a space as the first statement.

Press Ctrl and then the - key to open a variable length field, and then press Ctrl and the - key to close the field.

Type THEN and a space as the second statement, followed by another pair of Ctrl commands.

Type ELSE, space, and two more Ctrl commands.

Press a Return and Alt—to end the new character definition.

Here's what happens when next you press the Alt key, E key, and : key in sequence. An IF is printed and the cursor stops, waiting for you to enter a statement. When you strike Return, the computer prints THEN and waits for your next input and a Return. It then prints ELSE and

waits for the end of your BASIC statement. You could also nest a whole series of BASIC lines within a single script.

THE PROGRAM *appears to be appropriately safeguarded against most errors.*

In another use of the program, I assigned one character as an automatic letter preparation aid. Striking Ctrl and the P key causes the computer to print my home address against the right margin, pause at the proper column position to allow me to type in the current date (if you are using a word processor that allows you to exit momentarily to DOS, you could even have the command automatically enter the date

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based on the DOS DATE\$ statement), then skip down two lines to await my input of a mailing address, and then type "Dear" as the start of the salutation.

Saving The Day

Characters defined under *ProKey* are maintained in the memory of the PC until the power is shut off or the system is reset with a Ctrl-Alt-Del command. In order to save these special characters, you must create a file and save it on disk.

ProKey handles most of the house-keeping on file storage. All you need to do is to exit a program to DOS. Type PROKEY

(filename)/W to write a file. Other extensions are /M to merge a file into the computer's memory, /C to clear *ProKey*'s memory, and /Q to quit the program altogether.

Each file can contain as many as 93 key assignments, which cover a lot of special uses, but it would probably be best to create separate files for word processors, spreadsheets, programming languages, and other applications of your PC.

The *ProKey* files can be edited with any text editor. The instruction manual includes a glossary of the names the program automatically assigns to specialized key-

strokes. For example, a shifted F6 is listed in a *ProKey* table as <capsf6>; Ctrl backspace is listed as <ctrlbks>.

Loading ProKey

There are several ways to load *ProKey* into your PC. The most convenient is probably to copy *ProKey* onto each program disk, together with the file of special commands for that program. An AUTOEXEC.BAT program with the statement PROKEY (FILENAME)/R automatically loads the utility and the applicable table of special characters for that program.

Or, you can simply invoke *ProKey* from the DOS command prompt by typing its name. A legend on the screen would then prompt you to

please strike one of the following:
r to read a file into *ProKey* memory
m to merge a file into *ProKey* memory
w to write *ProKey* memory to a file
c to clear *ProKey* memory
i to install *ProKey*
q to quit *ProKey*

Quitting the program does not free up the RAM space occupied by the code. The only way to regain the space is to re-boot.

Error Handling

The program appears to be appropriately safeguarded against most errors—there is really not enough coding to the program to present many opportunities for problems. Error messages warn against improper file names or missing files, errors in structuring commands, and problems related to lack of memory or disk space. Commands that loop back on themselves also generate error messages.

A Professional Opinion

The essential question you must ask yourself is, "Am I satisfied with the way the programs I use relate to me and the uses I put them to?" If you are one of the ten computer owners in the world who is perfectly satisfied with the software design of some anonymous programmer in Silicon Valley, Cambridge, or somewhere in between, then you may not need *ProKey*.

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Note the strategic "or" in Howson's statement. If you use a PC solely for trade or business—as a writer, stockbroker, investment adviser, engineer, or accountant—the IRS treats it for tax purposes as any other piece of office equipment. The second part of Howson's statement is more interesting, and it might apply to a number of PC owners who think their PCs don't otherwise qualify for tax breaks. He says

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10%	Year 1	Year 2	Year 3	Year 4	Year 5
Investment					
Tax Credit	\$500.00				
Depreciation	\$712.50	\$1,045.00	\$997.50	\$997.50	\$997.50

Option 2: Assumes you reduce the Investment Tax Credit to 8 percent (the tax basis will remain at \$5,000).

8%	Year 1	Year 2	Year 3	Year 4	Year 5
Investment					
Tax Credit	\$400.00				
Depreciation	\$750.00	\$1,100.00	\$1,050.00	\$1,050.00	\$1,050.00

that you can take the Investment Tax Credit and depreciate the machine if you use it to "maintain or generate wealth."

If you use your PC to monitor a personal stock portfolio or to keep tax records and prepare your tax returns, you are using it to "maintain or generate wealth." If you have investments and use your computer to check the Dow Jones News/Retrieval service for financial information, or if you use it in a part-time business to bill clients, you are using it to "maintain or

port your claim. According to Wright of the IRS, the best record would be a log of the actual time spent on uses that maintain or generate wealth and those that don't.

Howson is a bit more sanguine. He suggests that you keep records for several periods, and then use this information to estimate the split for the entire year. But be careful not to load the numbers in your favor. If you include the week you prepare your tax returns and omit the summer months, when the kids are home playing computer games, you won't fool even the most nearsighted IRS auditor. If you are fair, reasonable, and accurate, you probably won't have any trouble establishing your claim to a tax deduction should you be asked to do so.

Investment Tax Credit

You can use the part of the purchase price of your PC that qualifies as a business expense in two ways to reduce your taxes. You can claim an Investment Tax Credit, or you can depreciate the machine.

To take the Investment Tax Credit you must determine the percentage of time you are using your PC in a trade or business or to maintain or generate wealth. Next you multiply the total cost of your machine by the percentage figure to determine the "tax basis." This is the amount on which the tax credit and depreciation will be figured. If you use your PC in only tax-deductible activities, the tax basis is 100 percent. If you can document that you use your machine 32.8 percent of the time for tax-deductible purposes, the tax basis is 32.8 percent of the purchase price.

To figure your Investment Tax Credit, multiply the tax basis by 10 percent. If your

machine cost \$4,000 and you used it 32.8 percent of the time for tax-deductible activities, your tax basis would be \$1,312 and your Investment Tax Credit would be \$131.20 (10 percent of \$1,312). You would enter this amount on IRS Form 3468. The credit is deducted directly from the taxes you owe Uncle Sam and it reduces your tax liability dollar for dollar regardless of your tax bracket. It's that simple.

Depreciation

Because your PC is a capital asset (meaning that it has a useful life of more than 1 year), you can depreciate it. To do this you reduce your taxable income by a depreciation allowance. Like the Investment Tax Credit, this allowance is based

SOME PC owners will be in for a pleasant surprise.

on the portion of the time you use the machine in tax-deductible activities.

Uncle Sam classifies your PC as "office equipment." Furthermore, the government assumes it will have a useful life of 5 years and has set up a depreciation schedule that allows you to depreciate 15 percent of the tax basis in the first year. If you purchased a PC for \$4,000 and used it solely for tax-deductible purposes, you could take a depreciation of \$600 in 1982 (15 percent of \$4,000). Because the allowance for depreciation reduces your taxable income, its value to you depends on your tax bracket. If you are in the 50 percent tax bracket, it will save you \$300 in taxes. If you are in the 20 percent tax bracket, the value of the \$600 deduction is only \$120.

To claim depreciation, enter the deduction on Schedule A of Form 1040 under "Miscellaneous Deductions." If you file Schedule C, enter it in the same place. If you do not itemize deductions, you can still use Schedule C to claim your depreciation. Since this may be a large deduction, you should append a note to your return explaining it and showing how you calculated the percentage of qualifying time. As Howson observes, "When you are dealing with the IRS, an ounce of prevention is worth a pound of cure."

QUALIFYING for a tax deduction is not an all or nothing proposition.

generate wealth." The IRS is particular on this point. Larry Wright, Public Affairs Officer for the IRS, says, "the key factor in determining whether your deduction will be allowed by the IRS is whether it is ultimately used to produce income."

The Part-Time Plaything

Qualifying for a tax deduction is not an all or nothing proposition. You may split the cost of the machine between deductible uses and personal uses. "A personal computer may be one asset physically," says Howson, "but it can be two assets for tax purposes." If you wish to split the cost of your machine for tax purposes, you must maintain timely, accurate records to sup-

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CIRCLE 402 ON READER SERVICE CARD

Because the useful life of a PC is assumed to be 5 years, you may take depreciation charges for the next 4 years in addition to the deduction you take in 1982. The rate for the second year is 22 percent. In each of the third, fourth, and fifth years it is 21 percent.

Most PC owners use their computers only part of the time in a trade or business or to maintain or generate wealth. The rest of the time they use them for personal, nondeductible applications. As with the Investment Tax Credit, you can depreciate only the part of the purchase price that qualifies for a tax deduction.

The Tax Reform Act of 1982

With the passage of the Tax Reform Act of 1982, Congress changed the rules governing depreciation and its relationship to the Investment Tax Credit. As of January 1, 1983, you must either reduce your tax basis by 50 percent of the Investment Tax Credit, or, if you wish to depreciate the entire purchase price, take an Investment Tax Credit of only 8 percent. For most taxpayers, the first method saves more money. However, since the real value of these options pertains to marginal tax rates, you should figure it both ways to discover which is better for you.

Table 1 shows the Depreciation and Investment Tax Credit calculated under the two options. The example assumes the

***BE CAREFUL
not to load the
numbers in your
favor.***

purchase of an IBM PC for \$4,000 some time in 1983. It further assumes that the machine is used for tax-deductible activities only, so that the entire purchase price qualifies for tax relief.

Expensing

"Expensing" is a term accountants use to mean "deduct in full." In general, you may expense any software or supplies such as disks, paper, or printer ribbons used in your trade or business or as an aid

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Listen. We're going to let you in on an industry secret: It's not hard to make a good spelling checker.

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Other spelling checkers "borrow" their words from printed dictionaries—or copy them from old word lists. Or give a programmer who can't spell "programmer" a chance to write his first dictionary. And as though all this wasn't bad enough, a lot of these

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CIRCLE 130 ON READER SERVICE CARD

to generating or maintaining wealth. You may use some software, the CP/M-86 operating system, for example, for both personal and business purposes. In this case you divide its cost just as you divided the cost of the PC. Using either Schedule A or Schedule C, you may expense only that fraction qualifying as a tax deduction.

In most cases, you will take an Investment Tax Credit and depreciate the expenditure to get the tax advantages of purchasing a PC. There is, however, one little-known but extremely beneficial exception to this rule. If you qualify, you can deduct the full cost of your computer system from your income the year you buy it. This deduction is subject to a ceiling of \$5,000. If you are in the 50 percent tax bracket, you could reduce your taxes by up to \$2,500 and have Uncle Sam pick up one-half the cost of your computer system.

To take advantage of this exception, you must use your personal computer for tax-deductible purposes only. You cannot use it for personal purposes. If you qualify,

the IRS allows you to expense up to \$5,000 per year instead of taking the Investment Tax Credit and 5 years of depreciation.

YOU MUST convince the Internal Revenue Service that your computer costs are legitimate business expenses.

Only the federal government allows Investment Tax Credits. You may, however, depreciate on your state income tax return the portion of the cost of your personal computer that qualifies as a business expense. This will, of course, reduce your state income tax liability. Unfortunately,

each state tax code is different, so you'll have to find out what rules apply in your state.

Forms, Accountants, and Advice

If you are buying a PC, you should be able to handle the tax issues without the aid of a tax lawyer or an accountant. However, if you buy and lease PCs to others, or if you are engaged in what is called a "lease-back" arrangement, you should get some expert advice. In general, you should contact a tax specialist if you feel there is anything out of the ordinary about your situation.

The Internal Revenue Service has a number of free pamphlets that are useful when it comes time to prepare income tax returns. They include 572, *Investment Credit*; 534, *Depreciation*; and 334, *A Tax Guide for Small Businesses*. You can pick them up at any district IRS office or you can have them sent to you by calling the phone number for "Forms" listed under IRS in the telephone book. /PC

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CIRCLE 427 ON READER SERVICE CARD

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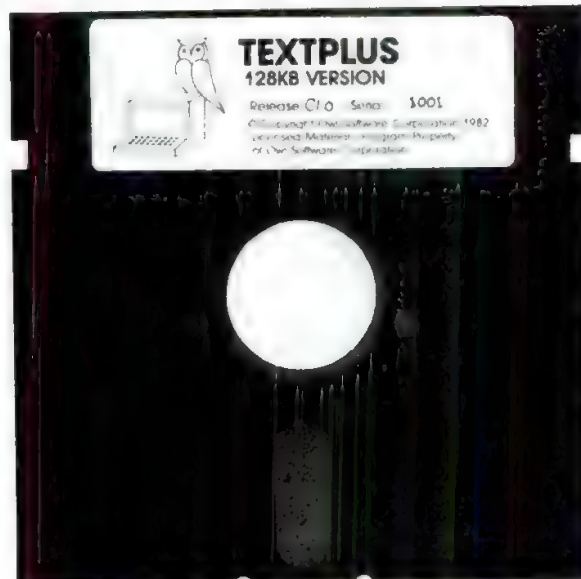
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You could actually buy up to a dozen programs to handle the chores TEXTPLUS was designed to handle. But, let's face it, it can take weeks for the salesman, secretary, or executive to learn how to operate them. And there's no assurance that they'll be compatible with each other.

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TEXTPLUS is available on 5 1/4" diskette in two versions: 64KB basic version (\$200) Faster 128KB compiled version includes print spooler (\$240).

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CIRCLE 115 ON READER SERVICE CARD

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HARDWARE

PrintMate 99

An 80-column graphics, dot matrix printer with standard tractor and friction feed. A 1K memory buffer is also standard. Both Centronics type and RS-232 interfaces are built into the printer. An additional 1K of memory and a single-sheet feeder for inserting letterhead paper are also available. (List Price: \$695; 1K memory \$25; single-sheet feeder \$25)

Requires: Centronics or RS-232 interface.

Micro Peripherals, Inc.
4426 S. Century Dr.
Salt Lake City, UT 84107
(801) 236-3081

Microfazer

A 1/2-megabyte computer printer memory that simultaneously increases computer output speed and printer efficiency. The Microfazer allows printing and computing to occur simultaneously because it performs the tasks of a buffer or spooler. The unit can also be used with graphics applications. The in-line memory serves to turn a "dumb" printer into a "smart" printer with from 8K to 512K RAM.

The unit is enclosed in a metal case and is equipped with a copy feature, allowing additional copies of the buffered information to be created.

Microfazer is user expandable from 8K to 512K and is sized to stack with modems, disk drives, and other peripherals. Some models can plug directly onto the back of a printer. (List Price: Parallel 8K \$169; serial to parallel 8K \$199; serial 8K \$229; other memory increments available)

Quadram Corporation
4357 Park Dr.
Norcross, GA 30093
(404) 923-6666

Sysgen I

A turnkey I/O subsystem that allows up to four PCs to share disk storage, tape backup, and printer port facilities. Features include a uniform software interface structure that allows a variety of hardware devices to be added to the system without having to rewrite software programs. Hardware and peripheral differences remain transparent to the PC's systems and applications software.

The subsystem features a hard disk from 6 to 40 megabytes, a 5-megabyte/minute streaming tape backup, and provisions for up to eight different device controllers per station. An RS-232C port for modem or printer, and a microprocessor-based, intelligent I/O processor.

The subsystem can interface with other I/O devices and features a built-in serially interfaced printer port. (List Price: \$4,995)

SYSGEN Inc.
354 Reed St.
Santa Clara, CA 95050
(408) 727-0988
Telex: 4990843

Sony Trinitron Color Monitor/TV

A color monitor that provides color/graphics abilities and UHF and VHF TV viewing. The monitor has 16-color capability and both RGB and video input. It includes an infrared remote control for TV viewing and a PC-compatible plug connector for color/graphics work. An audio output jack for stereo, a tape recorder, and an earphone are also provided. (List Price: \$699)

Requires: Color/graphics adapter.
Tokyo Electronics
222 Kearny St.
San Francisco, CA 94108
(415) 398-6884

D-Scan 5201

A color hard copy output device with high resolution that can produce single pages of full color or hard copy on standard paper.

The copier uses thermal image transfer to produce 150-dot-per-inch resolution. The D-Scan 5201 uses standard roll paper, ink sheet rolls, and does not require any other toners or inks.

The color copies are formed over a line-type thermal head that transfers singular dots of pigment coating from a wax-coated, "clean-hands" ink sheet. Final copies are cut auto-

clude black, white, red, green, and blue. (List Price: \$13,000)
Requires: Centronics parallel interface.

Seiko Instruments U.S.A., Inc.
2620 Augustine Dr. #140
Santa Clara, CA 95051
(408) 727-0768

Hard Disk Storage

A line of hard disk systems that allows users to expand computer storage to up to 15 megabytes (MB) of formatted memory or 19MB of unformatted.

The manufacturer has changed its hard disk expansion



Microfazer, Quadram Corporation

matically to standard 8 1/2- by 11-inch size.

The ink sheet comes in a segmented roll with 300, 11- by 25 1/2-inch sheets. Each of the sheets contains consecutive page-size bands of cyan, magenta, and yellow sections. The colors, together or overlapping, can generate eight colors that in-

product line to offer 5 MB of formatted (6 MB unformatted) or 10 MB formatted (12 MB unformatted) memory. (List Price: 15 MB \$2,995; 10 MB \$2,495; 5 MB \$1,995)

Davong Systems, Inc.
1061 Terra Bella Ave.
Mountain View, CA 94043
(415) 965-7130

New on the Market does not review products, but reports information provided by the manufacturer. If you have a product you would like to have included in this section, send a brief description that includes applications, price, and system requirements to *New on the Market*, PC 1528 Irving St., San Francisco, CA 94122. Photographs and illustrations are run on a space-available basis.

New On The Market



576K Maxicard, Vista Computer Company

PC-101

An 8-inch floppy disk controller that supports both single- and double-density formats. It will also support both single- and double-sided disks, yielding a capacity of up to 1.2 megabytes per disk.

A software support package that is included contains a BIOS, source drivers for the controller, and a program that will install the drivers onto a PC-DOS system disk. A utility program is provided to read files from a single-density CP/M disk onto a PC-DOS disk. (List Price: \$395) Microlog, Inc.
222 Route 59
Suffern, NY 10901
(914) 357-8086

576K Maxicard

A card that allows users to populate any and all 64K memory blocks between 64K and 640K with only one expansion slot. The addresses are DIP switch selectable and blocks are not required to be continuous.

The board uses 64K dynamic RAMs, runs at full speed with no wait states, and contains an on-board parity bit on each byte. Parity can be disabled by the user. A four-layer board design limits noise. (List Price: 64K \$379)
Vista Computer Company, Inc.
1317 E. Edinger
Santa Ana, CA 92705
(800) 854-8017, (714) 953-0523

MT 160 Matrix Printer

Two models of a 160 cps dot matrix printer that can be used for word processing, data processing, and graphics. The Model MT 160L provides letter quality printing.

Both models are 80-column impact printers and print using a high-density 40 by 18 matrix character at 40 cps. The data processing mode uses a 9 by 7 matrix character for 160 cps. It features bidirectional logic-seeking printhead travel and accelerated tabbing to increase throughput.

The Model MT 160L has a resident report package that provides letter quality printing, proportional spacing, margin justification, automatic centering, and daisy wheel code compatibility.

Dot addressable graphics, present in both models, allow users to produce bar charts, pie charts, and curves or other images created on a video screen. Both models can print four double-wide and three compressed-print character pitches plus a standard 10 cpi. (List Price: MT 160 from \$845; MT 160L from \$990)

Requires: Serial or parallel interface.

Mannesmann Tally
8301 S. 180th St.
Kent, WA 98032
(206) 251-5524

Spectrum

A multifunction board series that provides up to 256K of field expandable memory, two asynchronous communications lines, and a parallel printer port on a single circuit board. The board is available in 24 different, field-upgradeable configurations.

Memory is designed for expansion and is available in four configurations: 64K, 128K, 192K, and 256K. Field expansion kits are available in 64K increments. The memory section features parity checking, error reporting, and switch-selectable addressing on 64K boundaries.

The field-expandable, asynchronous communications function is available in single- or dual-channel configurations. Expansion kits are also available.

The parallel printer port allows users to choose from a variety of dot matrix, letter quality, and high-speed impact printers. (List Price: 64K expandable RAM board with single-channel asynchronous communications and parallel printer port \$555)

Requires: 64K.
Personal Systems Technology
22957 La Cadena
Laguna Hills, CA 92653
(714) 859-8871

Decision Support Interface

A printed circuit board that attaches via a coaxial cable to the PC to provide an interface to IBM's 3270 controllers.

The interface allows for the integration of personal computers into corporate data processing operations. It is able to transfer data files to PC storage and replace a 3278 CRT.

The Decision Support Interface operates in conjunction with existing 3270 controllers, both local and remote. Operating in native IBM 3278 mode, the interface does not require additional telephone lines, modems, or 3705 resources for installation. (List Price: \$1,195) Requires: 64K, one disk drive. Technical Analysis Corporation 120 W. Wieuca Rd. NE Atlanta, GA 30042 (404) 252-1045 Telex: 54-9600

PCX-6

An expansion frame that provides six additional system slots. Five optional board features are also available. Optional features include up to 192K additional memory in 65K increments with dynamic parity error correction circuitry (DPECC). Also optional are two asynchronous serial ports, three parallel ports, a real-time clock, and an extra power supply to furnish power to a disk drive.

The DPECC memory detects single- or double-bit parity errors and corrects single-bit errors without system CPU overhead and without interruption of data processing.

A fully socketed motherboard allows for installation of the options as needed. (List Price: \$595 without options) RCS Inc. 2166A Walsh Ave. Santa Clara, CA 95050 (408) 727-7548

Microvox

A text-to-speech synthesizer that translates ASCII characters into speech with a text-to-speech algorithm. Users type English text into the keyboard and ASCII code is sent to Microvox through either the RS-232C or parallel interface.

The synthesizer provides real-time audio output for applications in data processing, telecommunications, automation, education, or handicapped markets.

Microvox can accept data at high baud rates and annunciate over telephone lines to serve as an unlimited vocabulary audio interface for telephone transaction applications. The synthesizer features 64 digitally programmable levels of inflection and a high-fidelity professional voice quality.



IBM Personal Computer Primer Series, Computer Systems Research

When attached to a terminal keyboard, it can function as a typewriter for the blind or as a communicator for the vocally impaired. ASCII characters are recognized as they are typed and can be echoed automatically. (List Price: \$295)

Requires: RS-232C or parallel interface.

The Micromint Inc. 561 Willow Ave. Cedarhurst, NY 11516 (516) 374-6793

how to identify major components of the PC, how to develop a short BASIC program, and how to perform various functions such as loading DOS and copying disks. (List Price: \$150 per module)

Requires: 64K, one disk drive. Computer Systems Research 195 W. Main St. P.O. Box 45 Avon, CT 06001 (203) 678-1212

Moneytrack

A money management program that can maintain complete transaction records for small businesses, investments, or users' personal accounts. The program prepares a variety of reports to help meet the requirements of financial institutions and the Internal Revenue Service, and can print checks on different check forms.

Moneytrack comes with its own operating system and can be implemented by novices who have no knowledge of either programming or computers.

The program can be used by small-business owners, farmers, investors, accounting firms, financial advisers, business managers, and professionals such as doctors and lawyers. (List Price: \$450)

Requires: 64K, two disk drives, (printer recommended). Pacific Data Systems Inc. 6090 Sepulveda Blvd. Culver City, CA 90230 (213) 559-8713

SOFTWARE

The IBM Personal Computer Primer Series

A computer-aided, self-study program that teaches novices how to operate the PC.

The program consists of six stand-alone, self-paced learning modules: Major System Components, Using the Keyboard of the IBM Personal Computer, Basic Computer Concepts, Using the BASIC Computer Language, The Disk Operation System (DOS), and Problem Determination.

The program was designed for professionals, small-business managers, corporate executives, and managers.

The program teaches novices the basic concepts and terminology of data processing,



PCX-6 expansion frame, RCS Inc.

New On The Market

Information Network

The CHAIN-Computerized Head-End Access Information Network is a menu-driven program that aids monitoring and programming of the manufacturer's remote Power/Perfect 4500 and 5000 stand-alone management systems.

The systems control electrical and mechanical equipment by establishing duty cycling, demand limiting, optimal start/stop, and programmed start/stop.

CHAIN communicates with the remote Power/Perfect systems by nondedicated, dial-up telephone lines. Features include immediate reporting of off-normal conditions such as equipment failures and intru-

sion alarms. The program also automatically polls all connected systems daily and prints reports of energy usage data.

The program stores and transfers the data bases of remote systems, which allows password-authorized users to create or change data bases.

(List Price: Stand alone system \$4,000-\$6,000, depending on size of installation; software program \$1,500-\$3,000, depending on size of installation) **Requires:** 64K, one disk drive, asynchronous communications adapter, (printer recommended).

Johnson Controls, Inc.
P.O. Box 423
Milwaukee, WI 53201
(414) 274-4128

Economic Order Quantity

A business program that performs "what-if" analysis to help minimize inventory costs. The program provides the least costly answers to user's questions by calculating the Economic Order Quantity (EOQ) and the order point.

Features include sensitivity analysis and probability theory used to calculate the order point. Sensitivity analysis allows users to determine which variables cause the EOQ and the order point to vary. Probability theory is used to simulate variable demand. (List Price: \$174.95)

Requires: 64K, one disk drive, printer.

Execuware
4530 Park Rd. #348
Charlotte, NC 28209
(704) 525-9881

Queen of Hearts

Players make their way through a maze to find four missing cards. They must avoid the "card sharks" to keep playing. Keyboard or joysticks can be used. The game can be played in color or black and white. (List Price: \$35)

Requires: 64K, one disk drive.
TexaSoft
1028 N. Madison Ave.
Dallas, TX 75208
(214) 946-7912

Apple Panic

A keyboard-controlled, arcade-type game that pits users against apples in a multilevel mansion. Users must dig holes in the floor to trap pursuing apples. Graphics and animation are used. (List Price: \$34.95)

Requires: 64K, one disk drive, graphics adapter.
Brøderbund Software Inc.
1938 Fourth St.
San Rafael, CA 94901
(415) 456-6424

Word Challenge

A hidden word game in which players compete to construct the most words from a square of randomly selected letters. The game can provide an opponent and score the results. An 89,000-word lexicon is included.

The game has 26 different difficulty levels and uses the PC's sound, color, and screen formatting capabilities.

Features include a score keeper, an automatic timer that can be changed by the player, three different board sizes, the ability to create boards, and the ability to rotate boards for different perspectives.

The program can recreate any board it has ever played while in the competition mode. This feature allows any number of players to participate using the same board. (List Price: \$39.95)

Requires: 64K, one disk drive.
Proximity Devices Corporation
3511 N.E. 22nd Ave.
Fort Lauderdale, FL 33308
(305) 565-2188

SOFLOK

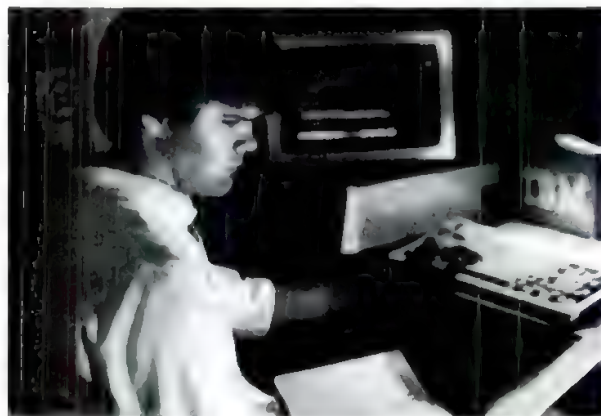
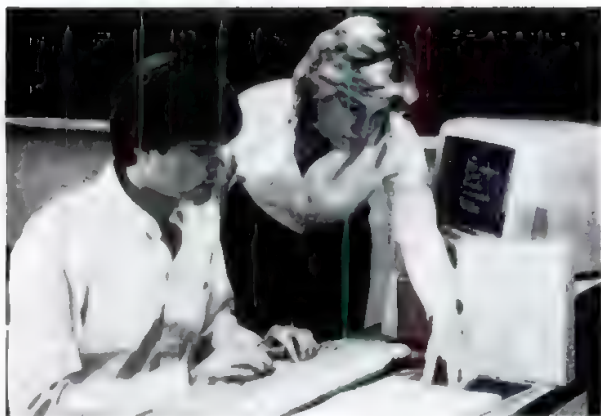
A program that provides copy protection for software. The program copies the user's program to a scratch disk in a form that can load and execute but cannot be copied. The program can accept a COM or EXE program for protection and uses minimal memory during the initial load. The area on the disk that holds PC-DOS is unused, so a bootable disk can be created later. No royalty must be paid on the protected copies, but use is restricted to protecting one program only. (List Price: \$150)

Requires: 32K, two disk drives.
Olive Branch Software
1715 Olive St.
Santa Barbara, CA 93101
(805) 962-4682

Economic Order Quantity, Execuware



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New On The Market

Micro Cookbook

A cookbook that provides recipes based on ingredients the user has available. The program includes recipes, nutrition guides, and a calorie counter. Users can enter their own recipes and shopping reminders.

Recipe selection is accomplished through three different methods: recipe name, category, and/or available ingredients.

(List Price: \$40)

Requires: 64K, one disk drive.

Virtual Combinatics
P.O. Box 755
Rockport, MA 01966
(617) 546-6553

SPF/PC

A full-screen editor that performs functions similar to IBM's ISPF/PDF mainframe editor. Features include four-way scrolling, Insert, Delete, Repeat, and Block Move/Copy. Files can be saved, created, and combined during an edit session by selecting all or part of the file being edited. (List Price: \$79.95)

Requires: 64K, one disk drive.
Rogue River Software
2822 Tahitian Ave.
Medford, OR 97501
(503) 779-9902

Addressor

A name and address filer system that produces an alphabetized telephone directory and can also print address labels. The phone directory can be inserted into a 2- by 3-inch folder. A tutorial on setting up the filing system and a disk that can be backed up are included. (List Price: \$19.95)

Requires: 64K, one disk drive, (printer recommended).
Single SOURCE Solution
P.O. Box 578
Concord, CA 94522
(415) 680-0202



Micro Cookbook, Virtual Combinatics

Payroll Package

A payroll program that can handle up to 200 employees. Features include interactive checking of input, 10 types of other pay, five recurring deductions, two limit deductions, departmental subtotals, and the ability to restart without restoring files even if errors are detected during report printing.

The program can produce transaction list, checks, departmental journal, check register, worksheet, master list, 941, and W-2. (List Price: \$300 including source code, documentation, and telephone assistance)

Requires: 64K, two disk drives, printer.
Ziegler and Company, Inc.
1173 Boulevard NE
Orangeburg, SC 29115
(803) 534-3740

The Personal Investor

The enhanced version of this investment program now includes features that allow users to manage and automatically collect quotations on options, bonds, mutual funds, and treasury bills. Users can also sell short on stocks and communicate with VisiCalc and other software through the data interchange format (DIF). Other software programs can be employed by users to create their own portfolio analysis and graphics.

Purchase price includes a password and 1-hour usage on the Dow Jones News/Retrieval service. (List Price: \$145)

Requires: 128K, one disk drive, (printer recommended).
PBL Corporation
P.O. Box 559
Wayzata, MN 55391
(612) 471-7644

Computerized Inventory System (COINS)

A program for coin collectors that allows them to enter information on their coins and produce different printed reports that can be used for personal investment and tax purposes. The program features a value file of information and market prices on 1,600 of the most common U.S. coins in all grades. The information is updated and distributed on a quarterly basis and provides the user with automatic evaluation. Nonstandard coins may also be listed and maintained by the user. (List Price: \$95; quarterly updates \$25 each)

Requires: 64K, two disk drives, printer.
Compu-Quote
6914 Berquist Ave.
Canoga Park, CA 91307
(213) 348-3662

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—Mike Rohrbach

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(software consultant)

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THE COMPUTER ROOM (IN, MI), COMPUTER SYSTEMS SPECIALIST (NY), COMPUTERLAND (participating dealers),
COMPUTERWORKS (CT), FREDERICK COMPUTER PRODUCTS (MD), FUTURE DATA (NYC), MICRO CENTER (OH),
PERSONAL BUSINESS COMPUTERS (UT), or phone (617) 366-0950 to locate the dealer near you.

CIRCLE 241 ON READER SERVICE CARD

New On The Market



Verfin head cleaner, Zolman International

EasyFiler-DOS

A revised version of the *EasyFiler* data base management system that is DOS based. PC-users can enter, manipulate, and report a variety of data, which can be written on both sides of a disk. The program handles up to 100 megabytes of data and has its own limited editor that allows it to act as a stand-alone mail merge. It can also create form letters.

The system provides ten key fields. Each record in the data base can contain up to 50 items, and any text field can contain up to 255 characters within a maximum record length of 1,000 characters.

The program is compatible with the *EasyWriter*. Upgrades to the current *EasyFiler* are available. (List Price: \$400)

Requires: 64K, two disk drives.
Information Unlimited Software
2401 Marinship Way
Sausalito, CA 94965
(415) 331-6700

Business Analysts

A series of personal business computer software programs that can be integrated as needed. Each module provides business managers with specific task management facilities and the ability to relate one application to another in the series. The series runs under the Executed Software Bus, which acts as an interface between the nontechnical user and the software to provide common commands, procedures, sign-ons, and security.

Included in the series are *Integrated Spreadsheet*, *Integrated Text Processing*, *Personal Records Management*, and *Communications*.

The bus allows these applications to be transportable be-

tween computers, and they can also be expanded. The bus comes with *Personal Records* and *Integrated Text Processing* installed. (List Price: Bus \$450; modules \$450-\$1,300)

Requires: 64K, two disk drives, (printer recommended).
Executec Corporation
12200 Park Central Dr.
Dallas, TX 75251
(214) 239-8080

Astalk

A communications and accounting program that links the PC to the General Electric Information Services Company's (GEISCO) Mark III remote computing service. The program can be used by businesses with multiple locations for communicating between sites and for transmitting accounting information.

Astalk combines the PC's effectiveness with the telecommunications network of the GEISCO mainframe. The program's accounting package includes General Ledger, Accounts Payable, and Payroll Applications.

The PC can build and edit data files and prepare reports while the GEISCO computers are used for data base and network capabilities. The program will also notify users when the disk is full. (List Price: \$495)

Requires: 64K, one disk drive, Bell 212A asynchronous modem, printer, DOS 1.0 and IBM asynchronous communication support version I, or DOS 1.10 and IBM asynchronous communication support version II.
Accounting Systems, Ltd.
P.O. Box 1488
Boise, ID 83701
(208) 336-2281

Expandson

A menu-driven program that mixes printing fonts within a single text. The program can be used alone or with *WordStar* and an Epson MX-80 printer.

Expandson allows users to create expanded, italicized, and compressed characters within a text. Foreign language characters, connected underlining, super- and subscripts, and printer-emphasized print can also be created.

Line graphics to create charts and logos are available along with reduced line spacing.

When used without *WordStar*, the program allows users to set many printing functions such as ignore paper out, double-strike, skip page perforation, expanded text, compressed text, and italics text. (List Price: \$39)

Requires: 64K, one disk drive, Epson MX-80 printer.
Blue Water Systems
P.O. Box 1877
Oceanside, CA 92054
(619) 722-0059

BASIC Aids

A programming tool for users who write structured BASIC programs. The program provides module extraction and global search and replace of source code saved in ASCII format. It also provides source listings with page control and a line cross-reference to help identify modules. Function key values are recalled from a user-defined default file. (List Price: \$20)

Requires: 64K, one disk drive, printer.
Tulsa Computer Consortium
P.O. Box 14097
Tulsa, OK 74104
(918) 747-0151

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LEARN TO SPEAK



Logo is the computer language that's sweeping the country with its simple "turtle geometry" way of learning computer literacy. And *Logo: An Introduction* is the new, easy-to-understand beginner's guide that makes learning and using Logo fun!

Written in simple language and set in big, easy-to-read type, *Logo: An Introduction* is specifically designed to be used by teachers and students who have little or no knowledge of Logo or computers.

Logo: An Introduction helps computer novices with:

- △ Creating simple shapes with the turtle and combining them to make more complex geometric forms
- △ Learning about "soft" and "hard" saves (temporary and permanent computer memory)
- △ Playing with symmetry and curves
- △ Learning about arithmetic, logic and Cartesian coordinates
- △ Using the idea of recursion—making a simple command repeat itself to perform more complex functions
- △ Experimenting with words and sentences—and more!

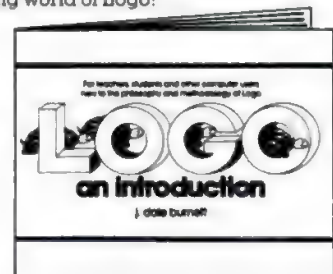
Logo: An Introduction doesn't bog you down or scare your students with complex technical details the way instruction manuals do. Instead, this book is written in an open-ended, exploratory style that captures the flexible spirit and freedom of Logo.

Use *Logo: An Introduction* as a supplement to your programming manual, as a sourcebook of ideas, as a primer on how to exploit the potential of this powerful language, and as a treasurehouse of suggestions for experiments with Logo. *Logo: an Introduction* is one book that belongs in your classroom or computer lab—and at only \$7.95, it's easy to order more than one, and

pass copies around to your students. Fill in and mail the coupon today, and enter the exciting world of Logo!

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New On The Market

Biz-Plan/PC

A turnkey business planning and forecasting system formerly available for the IBM 5110/20. The program's business features include automatic consolidations, automatic financial reports, formatted custom reports, over 50 English language commands, standard model 6400 data elements, disk expansion, "what if" analysis, and NOL carryforward.

The package includes hardware, software, consulting, and training. Hardware consists of a 256K PC with video monitor, printer, and two disks. Software consists of PC-DOS 1.10, five programming languages, a text editor, WordStar and Biz-Plan.

Consulting provides assistance with formulation of the initial planning module, while training provides on-site, hands-on instructions for Biz-Plan. (List Price: \$7,500)
Business Planning International
13139 Silver Saddle Ln.
Poway, CA 92064
(714) 487-2724

SPS-BBS 3.0

An electronic bulletin board system that can upload and download software and operate in a "CHAT" mode. A message package that allows scanning of messages by string or number is also provided. (List Price: \$99.95)

Requires: 64K, two disk drives, asynchronous communications adapter, auto-answer modem.
Small People Software Corp.
P.O. Box 732
College Park, MD 20740
(301) 937-4339
Micronet: 70065,101

Personal Data Base

A data base program for personal use and some business tasks. Personal applications include investment portfolio tracking, wedding and Christmas card lists, family histories, and household budgets and expenses. The program can be used for business tasks such as customer and mailing lists, inventory maintenance, tax records, client accounts, and job reports. Files and records can be made with complete control over the size and layout of all fields in the individual records. The data base can sort two fields simultaneously and search three fields simultaneously. This program can also average or total numeric columns on reports. (List Price: \$125)

Requires: 48K, one disk drive.
Super Soft Associates
P.O. Box 1628
Champaign, IL 61820
(217) 359-2112

Quikcalc

A new version of the Quikcalc Real Estate Investor that runs with SuperCalc instead of VisiCalc.

The program was designed to allow novice computer users to analyze both residential and income producing property sales and purchases. Each model in the program addresses such issues as financing structures, expense schedules, cash flow, tax benefits, and internal rate of return.

Financial functions are included for conventional mortgages, balloon payments, variable rate mortgages, and an interest-only loan.

The VisiCalc version of QuikCalc is also available. (List Price: \$129.95)

Requires: 64K, SuperCalc.
Simple Soft, Inc.
480 Eagle Dr. #101
Elk Grove, IL 60007
(312) 364-0752

Transporter

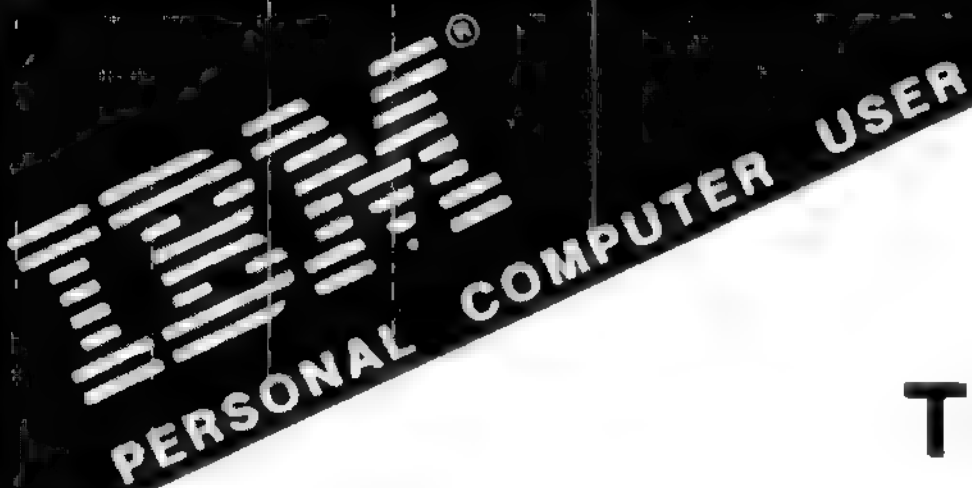
A communications program that allows system-to-system communication without operator intervention at either end.

The program allows the PC to dial into compatible systems and send or receive files. A novice operator can use the program's menu to create a task list that will give the computer instructions that are needed to do tasks without operator assistance. Sending and receiving files can be batched for unattended night transmission.

Transporter is compatible with the manufacturer's Crosstalk program. (List Price: \$295)
Requires: 96K, two disk drives, Hayes Stack Smartmodem or Smartmodem 1200, asynchronous communication adapter or equivalent RS-232 card, printer.
Microstuf
1845 The Exchange #205
Atlanta, GA 30339
(404) 952-0267



Quikcalc Real Estate Investor, Simple Soft



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Super Computer, Inc.

1710 E. Newport Cir., Suite P
Santa Ana, CA 92705
(714) 546-4866

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CIRCLE 438 ON READER SERVICE CARD

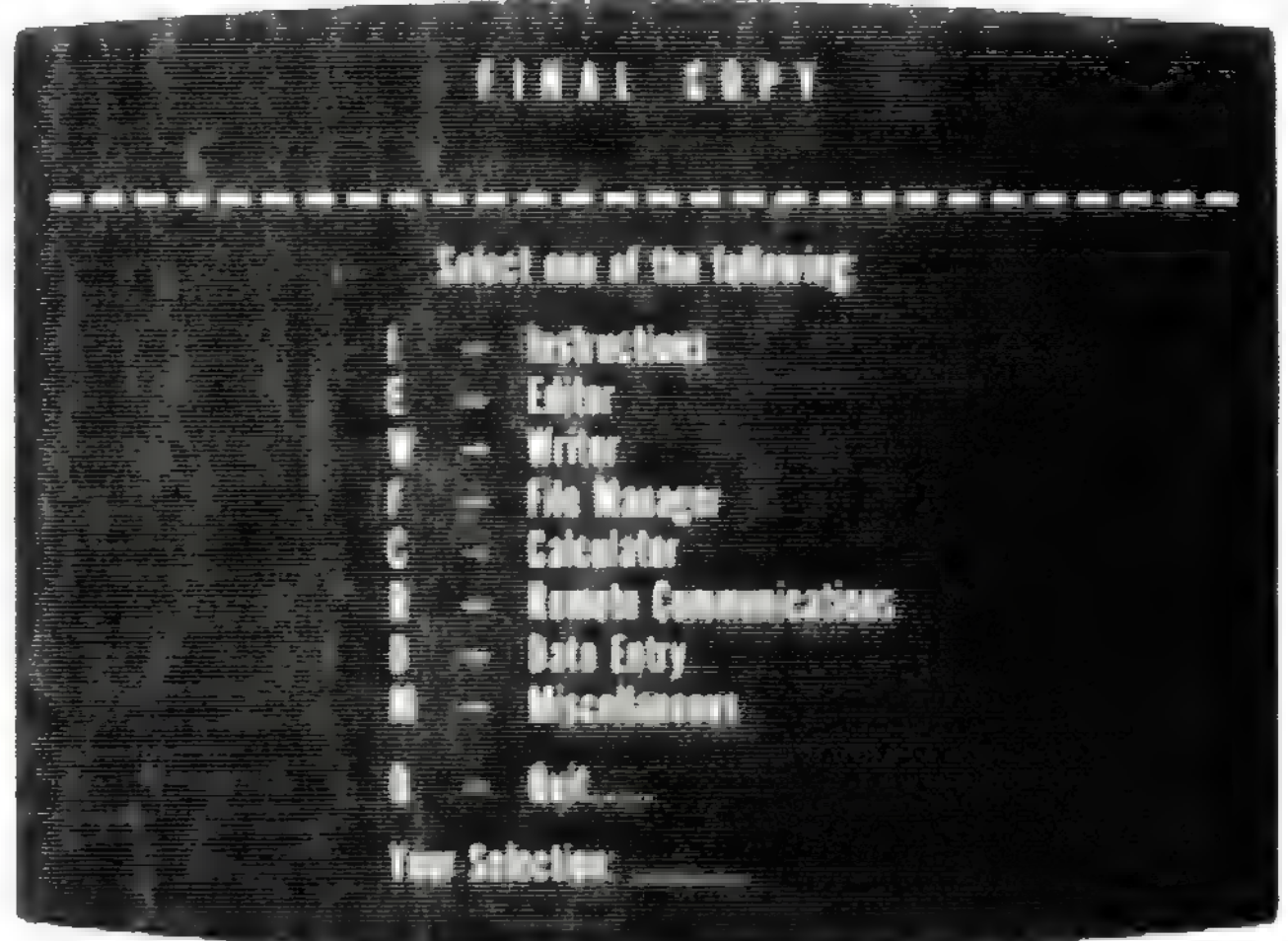
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New On The Market

Soloman Series I Accounting System

An accounting system that stores information in a single data base managed by the manufacturer's MDS data base manager.

Available modules include general ledger, payroll, payables and receivables, cash receipts, disbursements, order entry and invoicing, fixed assets, and name and address maintenance.

All relevant files are automatically updated, verified, and balanced when new data is input. (List Price: \$750)

Requires: 64K, one hard disk, Baby Blue card (132-column printer recommended).
Computech Group, Inc.
Main Line Industrial Park
Lee Boulevard
Frazer, PA 19355
(215) SOLOMON



Solomon Series I Accounting System, TLB, Inc.

SuperCalc²

An enhanced version of the SuperCalc spreadsheet program. SuperCalc² takes advantage of the PC's memory size, processing speed, and color display capabilities. The program contains a calendar clock for automatic calculation of date and time periods, and conditional summation of modular arithmetic. A memory extender function allows for larger spreadsheets.

Other features include an execute command allowing repetitive commands to be entered only once to facilitate worksheet linking.

Systems with color capabilities will display negative values and diagnostic messages in red and display protected formulas in yellow.

Specific enhanced features include consolidation, sort facility, and rounding functions. Additional formatting and print options are also included.

The program can share information with the manufacturer's SuperWare products and CP/M-based applications programs. (List Price: \$345)
Requires: 64K, one disk drive, DOS, CP/M with Baby Blue card.

Sorcim Corporation
2310 Lundy Ave.
San Jose, CA 95131
(408) 942-1727

Mail-Track-I

A program written in compiler form which stores up to 1,100 labels on a single-sided disk and 2,200 on a double-sided disk. The list remains in zip code order. When new information is entered, the program warns of duplications.

This mailing list program handles foreign addresses, stores several files on the same disk, and prints one to four labels across on a page. Selected entries can be moved to a different file and edited. (List Price: \$29)

Requires: 64K, one disk drive.
Sapana Micro Software
1305 South Rouse
Pittsburg, KS 66762
(316) 231-5023

TES 763

A multitasking terminal emulator that can replace the Texas Instruments 763 bubble memory terminal. This program runs under Digital Research's Concurrent CP/M-86 operating system and permits use of all the features of the IBM PC while concurrently exchanging information with the network host computer.

A principal benefit of this, other than its multitasking ability, is that it overcomes limitations of the TI 763. It can be expanded beyond 16 files, and can speed up data processing functions such as authentication. Expanding the memory of this device beyond 80K can be done economically since it is accomplished by expanding the memory of the PC. (List Price: \$495)
Requires: 256K, one disk drive, Digital Research Concurrent CP/M-86, RS-232C interface, modem.

Computer Distributors, Inc.
2603 W. 22nd St.
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(312) 325-2430

Pro Football Game

A simulation game that includes ten offensive plays, five defenses, and interceptions, fumbles, and penalties. Players can also punt; score touchdowns, field goals, and extra points; and declare safeties and time outs.

Users can play against the PC or against another player. (List Price: \$23.75)

Requires: 64K, DOS, BASICA, 80-column monitor, color/graphics adapter.
Strategic Alternatives
459 Homer #2
Palo Alto, CA 94301
(415) 328-4121



PC/InterComm, Mark of the Unicorn, Inc.

PC/InterComm

A DEC VT100 emulator that allows the user to communicate interactively with various host computer systems. The program has video terminal and full screen functions, allows upload and download data transfer, and can use the host's word processing and spreadsheet programs. Both a program manual and VT100 manual are included. (List Price: \$99)

Requires: 64K, one disk drive, RS-232C interface, modem.
Mark of the Unicorn, Inc.
Sales Department
P.O. Box 423
Arlington, MA 02174
(617) 489-1387

Sideways provides the user with a choice of two character fonts of different sizes, a double-strike option for added print density, and control over margins and character spacing. (List Price: \$60)
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MPX-16

A complete, single-board computer system that is fully compatible with applications software and hardware peripherals running on the PC.

The MPX-16 can use all the peripherals available for the PC but incorporates many devices as part of the basic board.

Designed around a 5 MHz Intel 8088 central processing unit, the MPX-16 offers 20-bit addressing capability for up to 1 megabyte of system memory. Provision is made for an Intel 8087 math coprocessor and a hard disk drive.

Standard features include 256K, two serial and three parallel I/O ports, a double-density floppy disk controller, and five expansion slots.

The stand-alone system communicates with users through a serially interfaced display terminal. The BIOS module of CP/M-86 is contained in a set of EPROM on the board. (List Price: 64K, assembled, \$1,895; in 100 quantity, \$1,200 each)

Requires: Serial terminal, one disk drive.

Micromint Inc.
561 Willow Ave.
Cedarhurst, NY 11516
(516) 374-6793

Datasaver

An AC power backup unit that prevents loss of data that may be caused by line power problems. The unit can also be used to make the PC into a portable system.

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By plugging an external battery into the jacks on the rear panel of the Datasaver, the PC can be powered by any 12-volt battery. (List Price: \$695)

Cuesta Systems, Inc.
3440 Roberto Court
San Luis Obispo, CA 93401
(805) 541-4160

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Scan Temp 8, Rodco Products

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600 Montgomery St.
San Francisco, CA 94111
(415) 421-5340

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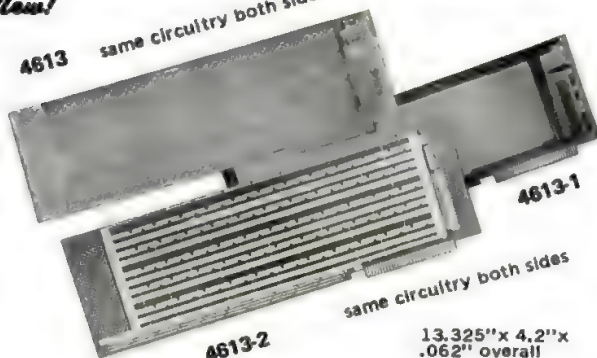
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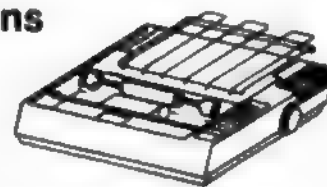
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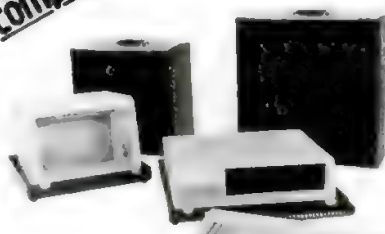
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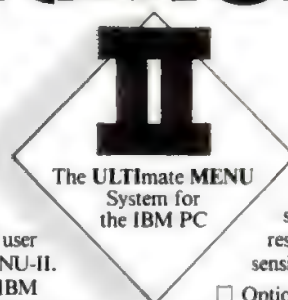
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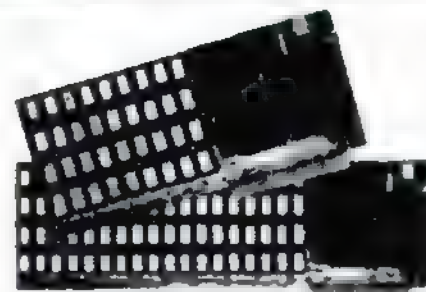


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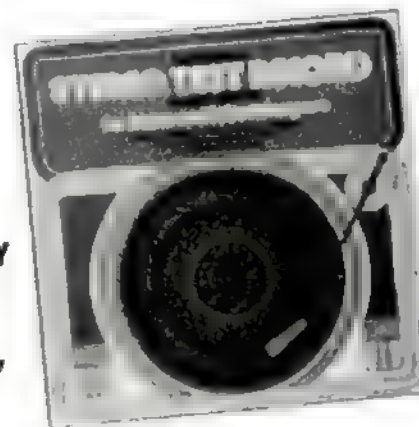
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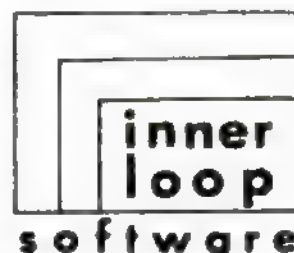
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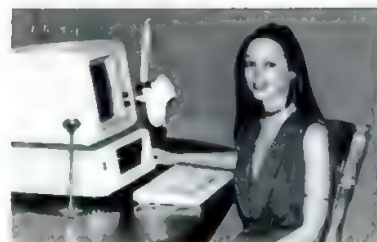
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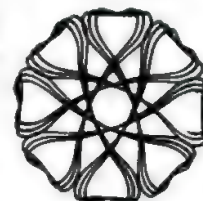
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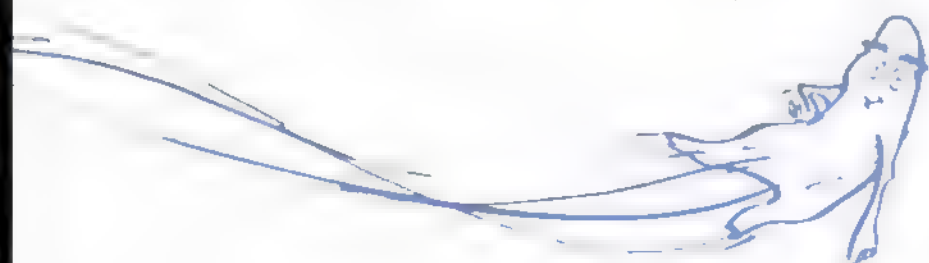
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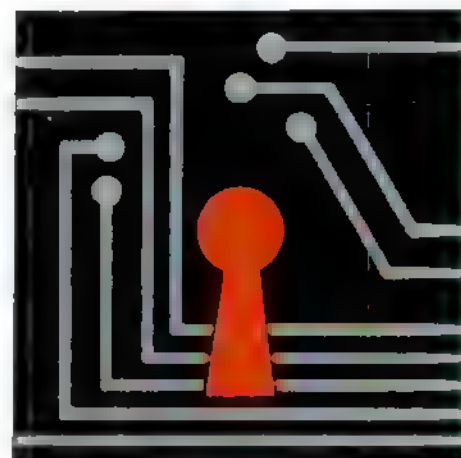
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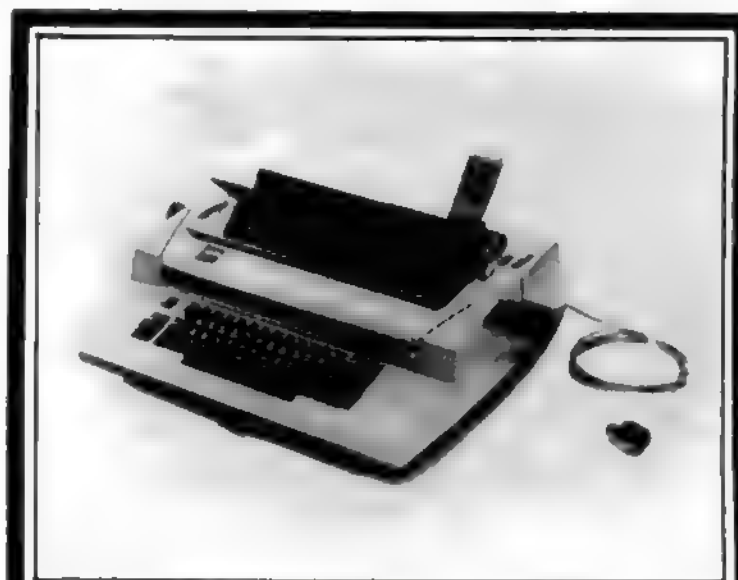
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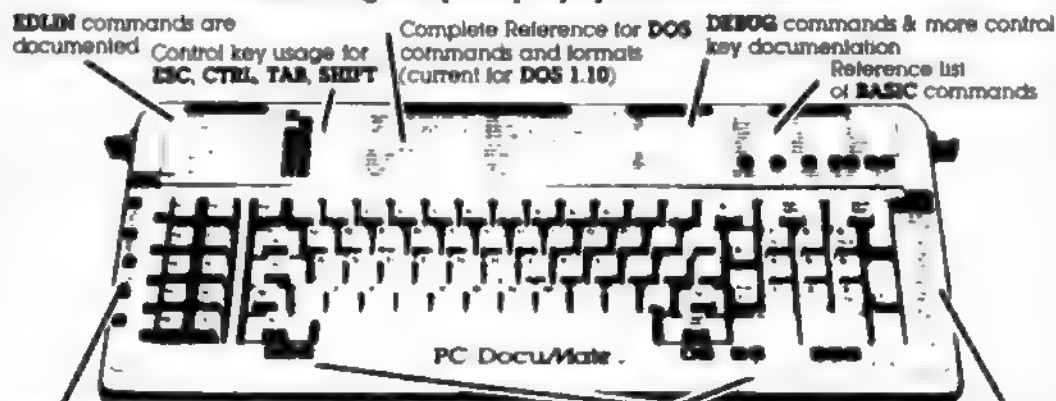
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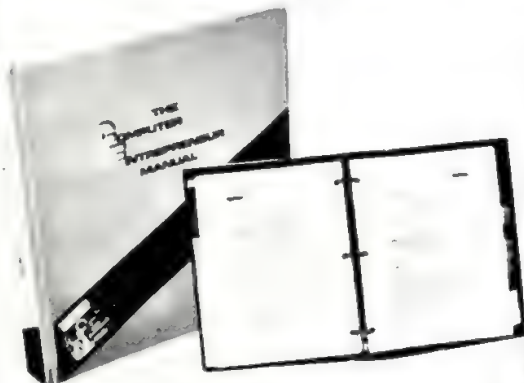
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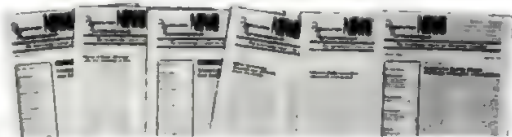
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EDITED BY WILL FASTIE

User-To-User

PC readers pass on their programming tips and tribulations. This month they share two ways to teach WordStar how to use the full power of the printer.

WordStar 3.2 Gets Its Turn

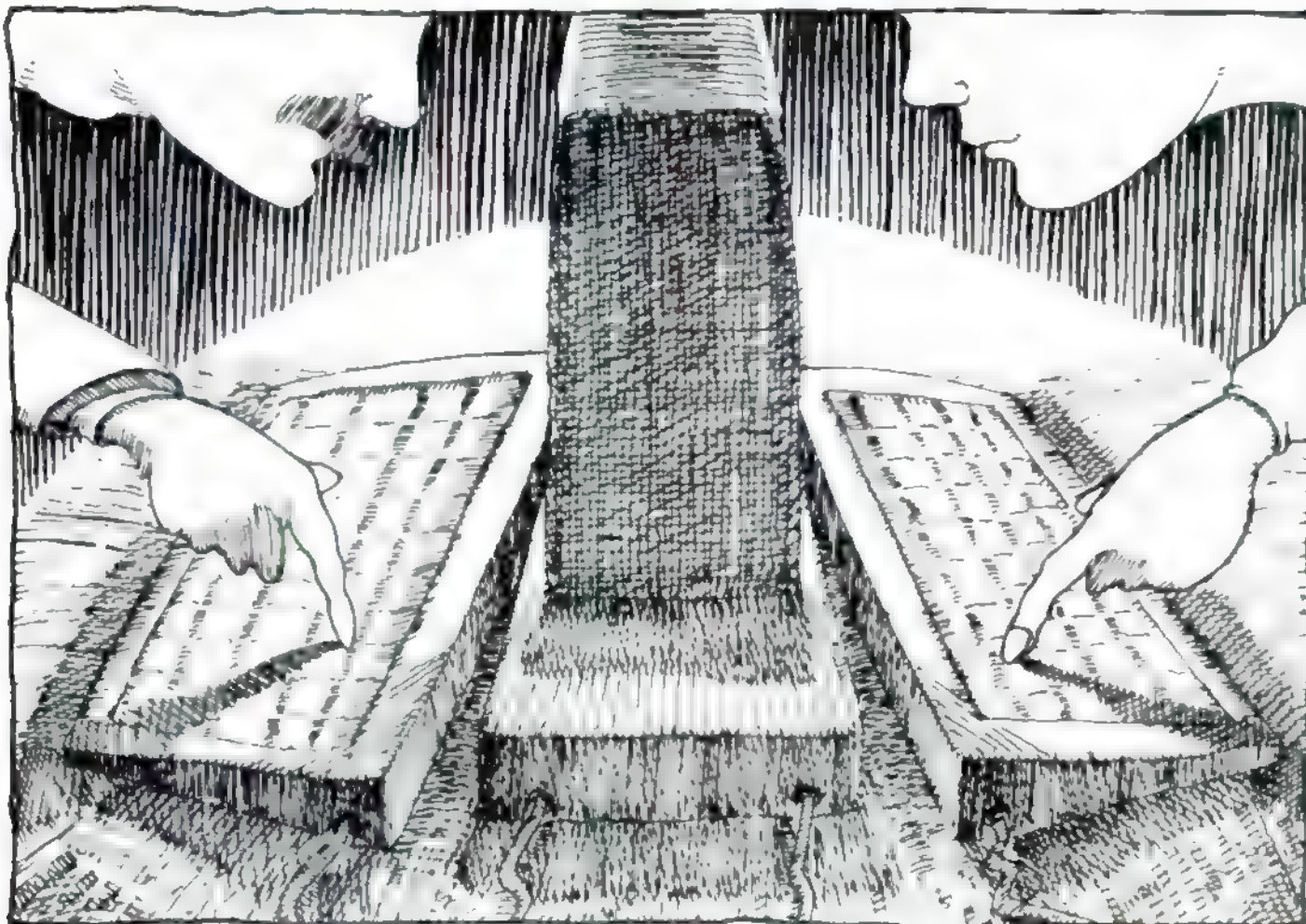
Quite a few readers sent us letters to call our attention to what appeared to be a mistake in "The PC Gets WordStar" (PC, November 1982). The readers were correct, but so was the article. This seeming contradiction is explained by the fact that two versions of WordStar are available: versions 3.02 and 3.2. The procedure described below applies only to these two versions; if you have an even more recent version, this method may not work. These patches are also not suitable for the version of WordStar on the Xedex Baby Blue CPM+ card. To find out which version you have, look at the label on the original disk that displays the WordStar logo.

"The PC Gets WordStar" included a section titled "Epson Printing from WordStar," which described a method that permits WordStar to engage additional features of the IBM (or Epson) printer that were not supported by WordStar in the delivered version of the program. A box on

page 127 described the procedure and explained that it applied to version 3.02 of WordStar. We're sorry that this information wasn't printed closer to the instructions themselves, which appeared on page

INSTALL.BAS
is written in BASIC
and is not protected, so
you can print a copy of
its listing.

132. We apologize to you users of WordStar 3.2 who may have seen only the instructions and wondered what was going on. An additional error in the instructions involved the use of the capital letter O instead of the numeral 0 in several places.



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Figure 1: Procedure for installing print features in WordStar 3.2 using Debug.

Step	Action
1	Insert the PC-DOS disk in Drive A
2	Insert the diskette with WordStar in Drive B (your copy of WordStar, not the original!)
3	Turn power on
4	Enter today's date and time
5	Enter: DEBUG B:WS.COM
6	Enter: D 077F 0792

The screen should display:

```
04B5:077F 00
04B5:0780 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 .....
04B5:0790 00 00 00
```

If the values at these locations are anything other than zeroes, do not proceed.

7	Enter: F 077F L2 01 0F
8	Enter: F 0784 L2 01 0E
9	Enter: F 0789 L2 01 1B
10	Enter: F 078E L3 02 12 14
11	Enter: D 077F 0792

The screen should display:

```
04B5:077F 01
04B5:0780 0F 00 00 00 01 0E 00 00-00 01 1B 00 00 00 02 12 .....
04B5:0790 14 00 00
```

If the values at these locations are anything other than zeroes, do not proceed.

12	Enter: W
13	Enter: Q
14	Remove PC-DOS disk from Drive A
15	Remove WordStar disk from Drive B and insert it in Drive A
16	Enter: WS
17	Try out the new print features.

WordStar includes listings of certain sections of the program. These sections are areas that can be changed to support features found on different printers. This adaptability is one of the reasons why WordStar has been so successful.

M***OST USERS**
do not feel
comfortable using the
Debug program to
make changes in
WordStar.*

Versions of WordStar for other computers included a program that made it easier for users to change these sections, and the manuals for those versions explained how to go about the patching process. These two aids are not included with the IBM version, so apparently PC users are left to fend for themselves.

Users of WordStar version 3.2 now can change their software to engage additional printer functions. A step-by-step description of the procedure, which uses the Debug program, is given in Figure 1. Figure 2 lists the WordStar commands that engage extended printer features.

Users of version 3.02, of course, can follow the steps given on page 132 in the No-

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vember issue; the addresses are different, but the two procedures are the same. Please remember that in Steps 7 and 8 and in the test lines following Step 11, all of the printed Os should be read as zeroes.

One caution to users who have grafted additional functions onto DOS, such as a printer spooler, a screen graphics dumper, or an electronic disk: not all of the addresses shown in Figure 1 will be correct. However, all the commands are the same for any case, and they should be entered exactly as shown.

—W.F.

Debug, Move Over

It's my view that most users do not feel comfortable using the Debug program to make changes in WordStar, or in any other program for that matter. Judy Epstein agrees, and sent the following letter.

"I have read with interest the comments on WordStar. I was fully aware that WordStar did not implement subscripts, superscripts, and other features, since the printer that was sold as part of the IBM PC system did not include these features. [Editor's Note: The new IBM printer supports these features.] I purchased the Epson MX-80 F/T-III with Grafrax-Plus, so I had a printer that was capable of many functions that WordStar could not invoke.

WORDSTAR
includes listings of
certain sections of the
program that can be
changed to support
features found on
different printers.

"Version 3.2 of WordStar includes patch areas that allow a user to customize the program for a particular printer. I asked MicroPro for help and they sent me useful information. However, using the Debug program to modify WordStar did not appeal to me. Instead, I used INSTALL.BAS, a program supplied on the WordStar disk. By following that program, and making some changes in it, I was able to make

Figure 2: Commands for engaging special print features. These can be used with WordStar 3.2 after following the procedure given in Figure 1.

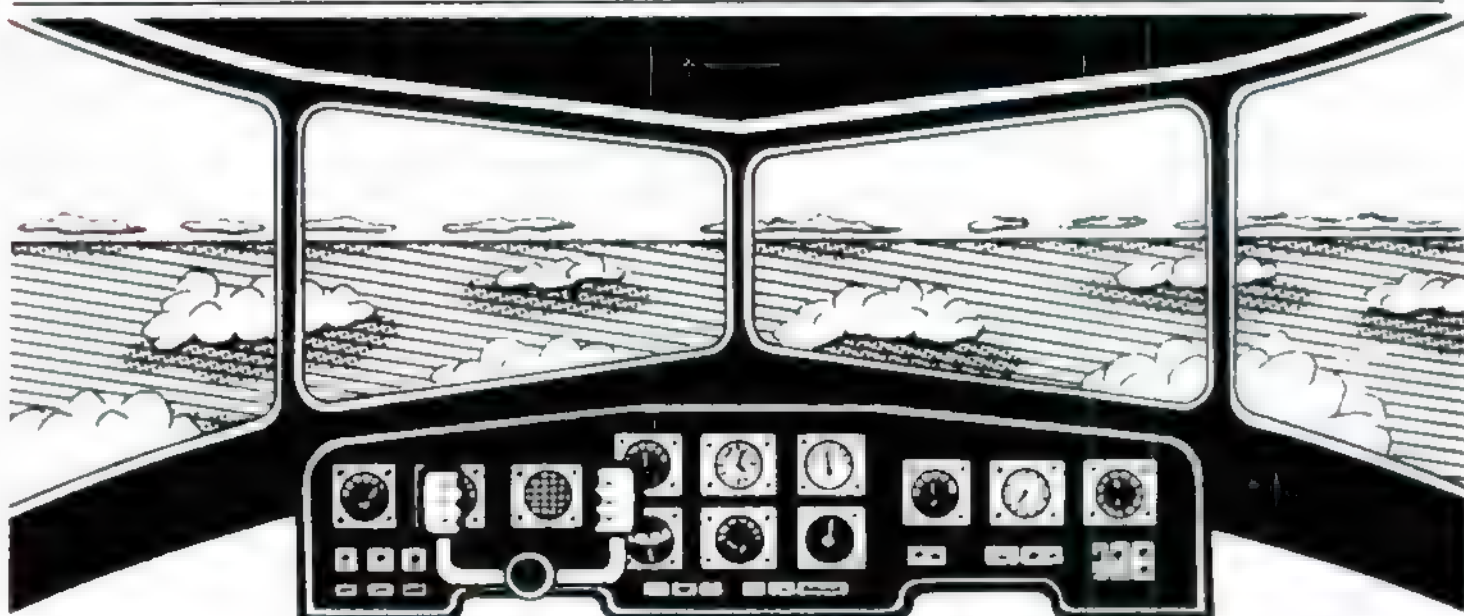
Feature	To Turn On	To Turn Off
Compressed Print	Ctrl PQ	Ctrl PR
Double Width Print	Ctrl PW	Ctrl PR
Emphasized Print	Ctrl PEE	Ctrl PEF
Double Strike	Ctrl PEG	Ctrl PEH
Ignore Paper Out (used for single sheet feed, PC-DOS V1.05 and later versions)	Ctrl PE8	Ctrl PE9

Note: The Ctrl PE sequence is the Epson ESCAPE. Any feature of your printer that can be obtained by the ESCAPE sequence can be invoked from WordStar once the patches have been made.

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WordStar support many features of my Epson printer, including super and subscripting, italics, emphasized printing, condensed printing, and double width printing. If you have a printer other than an Epson MX-80-III, you can still make the same kinds of changes by using the codes specific to your printer. Or, if you have an earlier version of the IBM printer, Grafrax can be added to it in the same way.

"The listing of changes to be made in INSTALL.BAS is shown below [see Figure 3]. Remember to add these lines to the program. It will not work the way it is."

Judy Epstein
Highland Park, Illinois

INSTALL.BAS is written in BASIC and is not protected, so you can print a copy of its listing. It contains a data area for all the sections in WordStar that can be changed and includes information about requirements for eight different printer models. The original program is very simple to operate, since it only asks you to select one of the eight printers for installation.

Epstein's program (Figure 3) is designed to be merged with the INSTALL.BAS program. The new hybrid program is still

the command MERGE "WSPATCH.TXT" and the new lines of program will write over the original lines. If you wish to run the program, just type RUN at this point. If you wish to save the new program, do so,

but for safety's sake give it a name other than INSTALL.BAS—perhaps CINSTALL.BAS to stand for "Custom INSTALLation."

There are some real advantages to in-

Figure 3. Listing of WSPATCH.TXT, a program to be merged with INSTALL.BAS. This permits WordStar 3.2 to engage special printer features.

```

41 '-----
42 ' WSPATCH.TXT          10-07-82
43 ' Additions to WordStar's INSTALL program to add printer features.
44 ' Extensions include super and sub scripting, condensed, italics,
45 ' double width, and emphasized
46 ' By Judy Epstein, COMPTICS, 3303 Dato Ave., Highland Park, Ill. 60035
47 ' use ^PD for superscripting
48 ' use ^PW for subscripting
49 ' use ^PR to shut off scripting, unidirectional and double strike
50 ' use ^PE for escape, followed by UPPERCASE codes as follows:
51 '     Emphasized print:      E turns on, F turns off
52 '     Double strike:        G turns on, H turns off
53 '     Italics:              4 turns on, 5 turns off
54 '
55 ' use ^Y toggle to turn condensed printing on and off
56 ' use ^PA for double width on
57 ' use ^PN for double width off
58 '-----
59 '
1240 ' Unconditional patch data. These bytes will be patched no matter what
1250 ' printer is selected.
1260 '
1261 ' Format of DATA is: address, byte, # of bytes
1331 'USR1 -- used for superscripting ***** invoke with ^PD
1332 DATA %H077F, 3, 1
1333 DATA %H0780, 27, 1
1334 DATA %H0781, 83, 1
1335 DATA %H0782, 0, 1
1336 'USR2 -- used for subscripting ***** invoke with ^PW
1337 DATA %H0784, 3, 1
1338 DATA %H0785, 27, 1
1339 DATA %H0786, 83, 1
1340 DATA %H0787, 1, 1
1341 'USR3 -- used as the ESCAPE character ***** invoke with ^PE
1342 DATA %H0789, 1, 1
1343 DATA %H078a, 27, 1
1344 'USR4 -- turns off script, double strike, unidirectional ***** ^PR
1345 DATA %H078e, 4, 1
1346 DATA %H078f, 27, 1
1347 DATA %H0790, 72, 1
1348 DATA %H0791, 27, 1
1349 DATA %H0792, 84, 1
1350 'PALT -- used to turn double width printing on **** invoke with ^PA
1351 DATA %H076b, 3, 1
1352 DATA %H076c, 27, 1
1353 DATA %H076d, 87, 1
1354 DATA %H076e, 1, 1
1355 'PSTD -- used to turn double width off ***** invoke with ^PN
1356 DATA %H0770, 3, 1
1357 DATA %H0771, 27, 1
1358 DATA %H0772, 87, 1
1359 DATA %H0773, 0, 1
1360 ' The next line indicates the end of the unconditional data
1361 DATA 0,0,0
1362 '
1363 '-----
2260 ' This data is specific to the IBM Parallel Printer
2261 ' It will be used when menu item #1 is selected.
2262 '
2360 ' RIBBON -- used to turn condensed printing on **** invoke with ^Y
2370 DATA 1, 15, 0, 0, 0
2380 '
2390 ' RIBOFF -- used to turn condensed printing off *** invoke with ^Y
2400 DATA 1, 18, 0, 0, 0
2410 '-----
2411 ' DO NOT USE LINES 2410 TO 2460 unless your printer matches one of
2412 ' the following specifications:
2413 ' IBM Parallel Printer Model 5152002 (new model)
2414 ' Epson MX80 (and F/T) Model III (includes GRAFTRAX-plus)
2415 ' Epson MX100 Model III (should also work on previous 100s)
2416 ' IBM Model 5152001 (old model) upgraded with GRAFTRAX
2417 ' Epson MX80 upgraded with GRAFTRAX
2418 '
2420 ' PSINIT -- used to initialize printer *****
2430 DATA 2, %h1b, %h40, 0,0,0,0,0,0,0,0,0,0,0,0,0,0
2440 '
2450 ' PSFINI -- used to reset printer when done *****
2460 DATA 2, %h1b, %h40, 0,0,0,0,0,0,0,0,0,0,0,0,0,0

```

THIS PROGRAM
*is a nice piece of work
on the part of Epstein.*

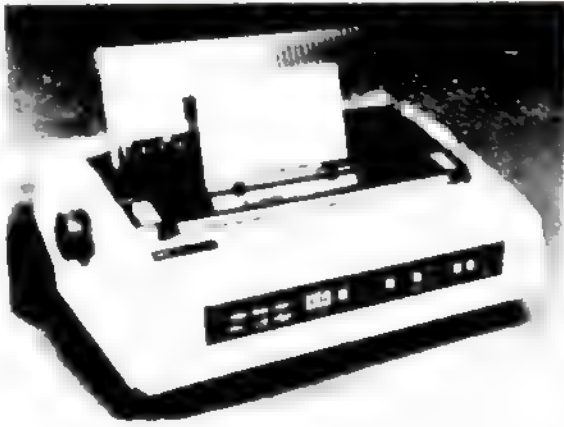
limited to eight types of printers, but the new lines of code contain additional information about the new model of IBM's printer. Once this program segment is merged with INSTALL.BAS, changes can be made in WordStar automatically.

To create the hybrid program, enter BASIC mode and type in the WSPATCH.TXT program as shown in Figure 3. Be very careful to get all the line numbers correct, because lines in this program will replace lines of the same numbers in INSTALL.BAS when the two programs are merged.

When the program is completely entered, type SAVE "WSPATCH.TXT", A to save the program segment in text format (ASCII code). Include the .TXT extension so you can tell the difference between text files and BASIC files. Now load the INSTALL.BAS program into BASIC. Enter

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vesting the time in making program changes this way. One is that a BASIC program can be annotated with comments to help you remember what you did if you look at the program again a year from now. Best of all is that there is less risk of ruining WordStar by using this program than by making changes using Debug. The operation is completely automatic once you can run INSTALL.BAS and input the values to be used.

This program is a nice piece of work on the part of Epstein. I wonder why MicroPro hasn't made the existence of INSTALL.BAS more noticeable. I also wonder why MicroPro has not written a more powerful version of the program that would allow all the printer code sequences to be defined interactively, perhaps with symbols as well as text prompts. I'd like to be prompted with names to select the desired changes from a menu, and have the program remind me to input every little detail. WordStar is not so accommodating.

The printing capabilities of WordStar that can be tapped by using Epstein's pro-

Figure 4: Examples of special printer features engaged by WordStar 3.2 after it has been patched using a program created by merging WSPATCH.TXT and INSTALL.BAS.

This is standard print.

This line is double strike print.

This line is emphasized print.

This line is printed in Italics.

The rest of this line is superscripted.

The rest of this line is subscripted.

This line is printed in compressed mode.

This line is double width.

gram are demonstrated in Figure 4. Keep in mind that you must have a printer with GraTrax-Plus or the new version of the IBM Parallel Printer for this program to work. If you have some other Epson printer, you'll have to make appropriate modifications to use this technique. /PC

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A famed computer scientist steps back to get a better look at the information explosion. In this excerpt, he describes the mixed view.

Nurturing The Computer Grapevine

The Network Revolution: Confessions of a Computer Scientist

Jacques Vallee

(And/Or Press Inc., Berkeley, California, 1982)

213 pages, \$7.95

The computer has evolved into a two-headed beast, and we are faced with two choices: digital society and the grapevine alternative. In the former, computers are repressive tools that reduce people to statistics. In the latter, computers are used to build information networks, as aids to intraglobal communication.

In his introduction to *The Network Revolution*, Jacques Vallee examines these choices and shows how mankind must make an effort to demystify computers in order to make an informed, responsible choice. A second excerpt from Chapter 10 demonstrates the potential power of the networking system when used to improve the quality of life.

On Friday, 9 November 1979, at 10 p.m., three young men driving on Highway 20 stopped at a gas station in Etampes, near Paris. Twenty-year-old Claude Francois was at the wheel. With him were Baptistin Lamont and Marcel Seltier. They were on their way to a dance in Salbris.

"Fill it up!" said Francois.

Mr. Nicolas, the service station operator, took a dim view of the tattered blue jeans, the leather jackets, the license number which did not look right because it was patched up with bits of black tape (3383 FM 13, indicating the car was not from the

NICOLAS
called the police to
report the
"suspicious" car.

local area). Francois paid with a check on which his signature was hurriedly scrawled. Nicolas took it, reluctantly, but called the police to report the "suspicious" car and its even more disreputable occupants.

In Etampes, police officers went to the computer terminal linking them with the central file of the Interior Ministry, in Paris, a file whose very existence had recently been denied by a Cabinet member. In response to a brief flurry of commands, the police entered the car's license number into the computer's memory for checking against its data bank. The system soon flashed its verdict: the vehicle was stolen.

Etampes called Orleans on the phone. A special night brigade was dispatched.

The white and black police Renault intercepted the Peugeot driven by Francois at a red light. Then everything happened very fast. The only police officer in uniform stayed inside the Renault: the other two, in civilian clothes, got out. One of them covered the Peugeot with his machine gun at the ready. The other stood in front of the suspect's car and armed his .357 Magnum. One of the young men, Marcel Seltier, reported:

We didn't understand anything. We saw the one with the gun aim at Claude. A moment later, a shot rang out. The bullet went through the windshield and hit Claude's face just under the nose. We thought they were gangsters. The one with the machine gun yelled: "Why did you shoot?"

We got out of the car.
Claude collapsed



on the road. Right away they handcuffed us and told us they were the police. They called an ambulance. Claude was taken to a hospital. We went to the police station. They searched us and took our papers.

Subsequent investigation disclosed that the car belonged to Francois, who had bought it, legally, ten days before. It had indeed been stolen in 1976, but it was soon recovered by the insurance company.

THE **computer file had** **never been updated to** **reflect the change in** **the status of the car.**

which sold it to the garage where Francois bought it. The computer file had never been updated to reflect the change in the status of the car. The central police records still regarded it as stolen property.

The trigger-happy policeman was not arrested. Claude Francois remained between life and death for many days. He is still in the hospital as I begin writing this book.

This unfortunate incident illustrates several features of the world in which we are already living. Mistrust at the gas pump has led to police action; faith in the infallibility of the computer has turned the casual inquiry into an all-out investigation. Inadequate standards and a mistaken view of the computer power has linked an innocent man with a forgotten crime. An over-zealous bully, with a big gun provided by a frightened government, did the rest: sure of his facts, the plainclothes policeman standing in the glare of the little car's headlights was firing in more than the name of society. His .357 Magnum was only the last piece of hardware in the hand of the long arm of the law. It was the most visibly destructive component in a system that included computers, terminals, programs, and telephone lines.

It is with this type of system that the present book is concerned.

Computer technology is the most powerful force changing human society today. Over the next generation, every man,

woman, and child will have the ability to use computers for access to facts, to organizations, and—most importantly—to other human beings. There is a new type of structure that makes this access possible. It is called a *network*.

Computer networks can be used by a repressive government to look for undesirables or to flag suspects, but they can also be used by individuals to share thoughts and facts, novel ideas, visions of humanity's future destiny. They constitute communications media unparalleled in human history. And they lead us to a momentous decision.

Computer networks are going to force us in the next few years to make a choice between two types of society: I have designated them as the "Digital Society" and the "Grapevine Alternative."

In the Digital Society, massive amounts of computer technology are used to control people by reducing them to statistics. In the Digital Society, computers are repressive tools and their use for private communication is discouraged.

In the Grapevine Alternative, on the contrary, computers are used by people to build networks. And beyond the simple

use of these networks for information we find people actually communicating through them. This use of computer networks for group communication is a dynamic force that began in obscure research organizations ten years ago. It is now ready to explode in public view. The explosion will be helped by the growing demand for home computers, for new television services, for access to data bases and information sources. But it will go far beyond such applications when people in large numbers discover in these networks gateways to other minds, windows to unsuspected vistas, bridges across their loneliness, and precious understanding.

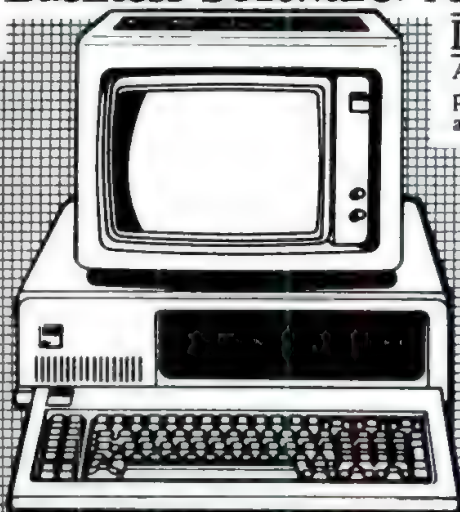
How can we make the choice between these two societies, which utilize essentially the same advanced technology for radically different purposes? First, we must demystify computers. We must strip them of the aura of complexity that technocrats like to weave around them. For this reason this book will not talk about bits and bytes, addresses, and operating systems, because such knowledge is not relevant to what computers actually do.

Having demystified computers, we need to understand their history; it is only



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through such an understanding that we can learn to influence the technology. For any good information system can become a dis-information tool. Any powerful new technique carries with it new fears, and new pitfalls. I offer my own Confessions as a starting point to understand the choice we have to make, to influence the explosion to come, to help decide what kind of quality of life we want in the future.

I have worked with computers since 1960, beginning with the first commercial models of IBM and living through successive "generations" of hardware (the machines themselves) and software (the programs of instructions that specify the machine's work.) Throughout these fascinating revolutions I have never lost the wonder and the joy that my first encounter with computers provided, but I have become increasingly concerned that we are leaving almost no trace of our activity at the human level. Our motivations, our hopes and our fears were left unsaid, because it always seemed that the technology was moving too fast for us to stop and think. It never does, though, and there is no excuse for the enormous gap our profession is leaving in the book of history, where it will appear that the computer age emerged without transition, or friction, from the shadows of the last war.

The literature of computing—a science that did not exist forty years ago—is already filling up entire buildings. But it consists of technical information, couched in the obscure jargon of bits and bytes, concentrators and modems, pushdown stacks and recursive procedures. This amorphous pseudowriting swims in a sea of acronyms, and acronyms of acronyms, at the extreme edge of the capabilities of the English language, so that only the writer and the miniscule technical community around him can comprehend what is being discussed and then, only for the brief period between the time the idea seems preposterous, farfetched and impractical, and the time it is already obsolete (which generally coincides with publication of the article).

Computer scientists have documented everything in the world except for their own work. The human side of the technology is not recorded anywhere. On the shelves of every sociology department are scholarly tomes discussing the impact of computers on nearly everything; but only

an expert can decipher the statistical relevance of surveys and impact studies which, in the final analysis, have little meaning, and carefully avoid guiding the reader toward any practical decision.

The research reports sleep in the archives of the government, gathering dust. They, too, hide the true story of computers: Washington is as puzzled by the beasts as everybody else. At the other end of the

C

**OMPUTER
networks are going to
force us in the next
few years to make a
choice between two
types of society.**

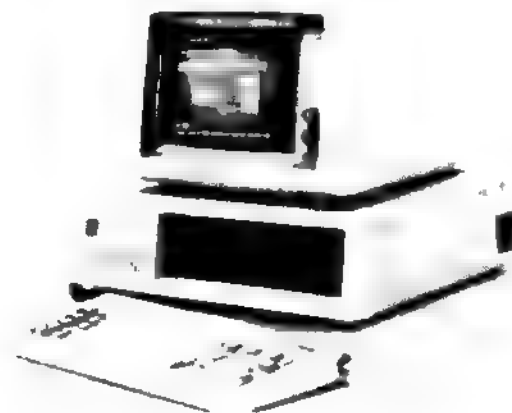
country is the once-lovely Santa Clara Valley, now the smoggy, noisy Silicon Gulch, Capital of High-Tech, Rome and Mecca to thousands of computer freaks building their own terminals in basements. Strange new networks are being grown here and forcibly spliced into the nervous system of the old culture. New forms of love, of worship and of crime are taking shape in a social explosion that has no precedent. Again, it is going unrecorded.

There are only two books about IBM, one of them officially authorized by the amazing company that has shaped so surely the technology and, through the technology, the world we experience. Other personal accounts of life with computers are cautions and cold, tempered by the care taken to anger no one and to preserve that most cherished illusion of academia: the appearance that the human race, good or evil, has some measure of control over its creations.

I have concluded from my work with computers that we are no longer in control of this exploding technology. But we can still hope to influence the general direction of the blast.

As a research scientist with the computing center of several universities, and as a computer engineer with industrial companies, I have followed the technol-

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ogy closely. I recall one meeting of an international standards organization at which I was introduced to a gentle lady with white hair, whom everyone regarded with obvious admiration. I was told that she was the person who had tapped the founder of American computer science, Professor John Von Neumann, on the shoulder one day to tell him that the world's first scientific computer needed a STOP instruction. It had not occurred to anyone that the machine might need a way to stop its operation under program control. But there is no STOP instruction for the network-based society we are now building.

In the world of information networks, visionaries have already produced enthusiastic speculations. In Redondo Beach, there is a "Consciousness Synthesis Clearing House" that is said to be "evolving a general understanding of the networking process and the development of an overarching perspective from which to view this vital phenomenon." In Pittsburgh, Rolf Von Eckartsberg has set up a network for the exchange of information about psychedelics. In Washington, Barbara Hubbard has created a "Committee for the Future" that promotes the exchange of ideas about world problems. Carol Rosin directs an "International Association of Educators for World Peace" working for a "peaceful and permanent manned occupation of space." Some of these "networks" are nothing more than a mimeographed list of addresses and phone numbers. Others are built around CB radios and improvised channels. Still others, the most interesting ones, are constructed around computer links that give their users access to data bases and sophisticated programs.

Advocates of networking believe that the new technology can solve a lot of social problems. In the words of Willard Van de Bogart (in *Future Life*, December 1981), "the Information Network is aware of current research being done by all aspects of science. The Information Network is also aware of political decisions and their global implications. This network shares in the ideologies and philosophies of those people that have integrated universal operating principles..."

Those are heady ideals indeed. But they are based on assumptions that are too simplistic. The potential for a wealth of

new benefits from this technology is certainly real. But with these benefits come myths, dangers, and complex enigmas. They find their origin in the very basis of cybernetics.

One of the founders of cybernetics, the late Norbert Wiener, called it "The Science of Communication and Control in the Animal and the Machine." This definition, as Stafford Beer has since pointed out, suggests two ideas. The first is that distinctions between the animate and the inanimate, inherited from the Greeks, do not apply to the laws of regulation, an observation to which I will return later in the book when we discuss the subject of androids. The second idea is that communication is control, and that information is control.

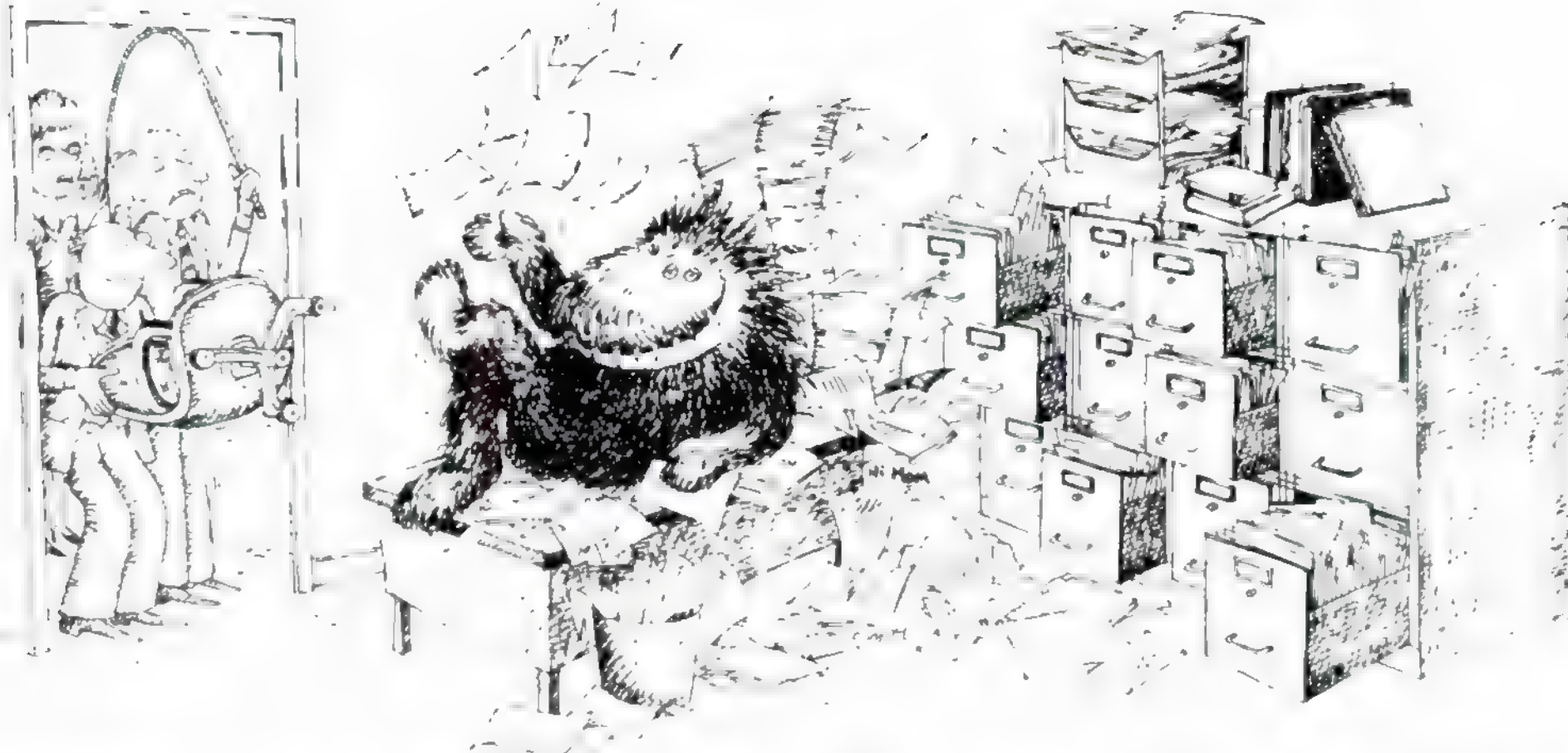
Any book concerned with computers must begin with this fact.

There is no such thing as obtaining information (by consulting a file, for instance) without obtaining a measure of control over the objects or persons which the file describes. Poor Claude Francois, in his hospital bed, is an illustration and a victim of that law. Later in the book I will show how an understanding of this principle, in the building of the French police system, would have made such a mistake impossible or at least very unlikely. But the meaning of Wiener's observation goes deeper still, for the fascination with computers is symptomatic of the quest for power. Often disguised as a scholarly pursuit of

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information, or as "the mere compilation of passive data," the true motivations of computer architects are difficult to discern, and their impact almost ungovernable.

Soviet professor Andrei Ershov is one of the few writers to combine actual knowledge of computers with an awareness of the personal challenge they pose. He has pointed out that "programmers constitute the first large group whose work brings them to the limits of human know-



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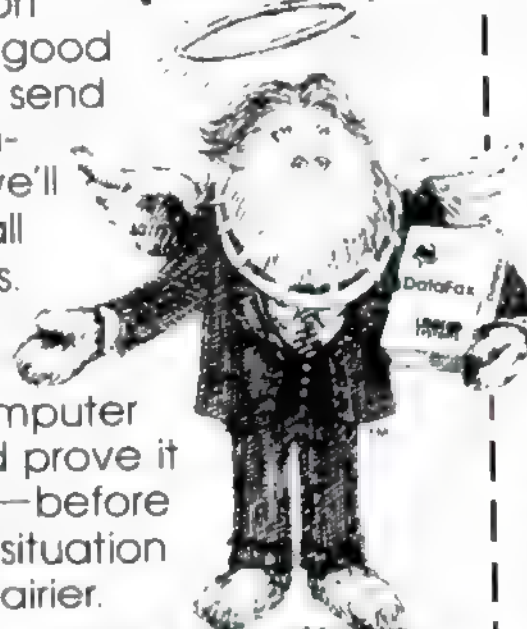
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ledge... which touch upon deeply secret aspects of the human brain." It is the exploration of these "deeply secret aspects" that prompted me to become a programmer in the first place, and it is to such an adventure that I now invite the reader.

The dangers inherent in the use of computer power are clear. Before we proceed with our investigation, however, these dangers must be balanced against the present reality and the future promise. The computer industry is a major factor of true progress in our society, changing every aspect of industry with which it has come in contact. It has already become an important contributor to the wealth of nations, and is about to collide with, and compete with, the older and bigger telecommunications industry—which accounts for over 10 percent of all plant and equipment expenditures made by American corporations for the last twenty years. The telecommunications industry is responsible for more than 20 percent of all corporate debt, and takes in revenue twice as fast as the gross national product of the

U.S. In 1978, the information technology areas employed 51 percent of our work force and earned 47 percent of our GNP.

F **AITH** *in the infallibility of the computer has turned the casual inquiry into an all-out investigation.*

(It is also useful to keep in mind that it would take an investment of \$50 billion, over the next thirty years, to bring the rest of the world up to the level of communication now found in North America.) This is the plum which the computer industry now hopes to pluck.

The immense economic power of the telecommunications industry constitutes

the "base camp" from which computer power will assault the old structures. One example: in the single area of "computer conferencing" (the use of computers to link people together), some scientists have already envisioned the rapid obsolescence of many education techniques, the electronic replacement of 80 percent of business mail, and a significant alteration of transportation and settlement patterns. When these effects were first suggested in a Futurist article in 1974, there were only about a hundred persons in the world engaging in such "computer conferencing." By the end of the decade they numbered in the thousands, and Dr. Michael Arbib suggested that the building of a "Global Brain for Mankind" was an urgent necessity. Can we build such a brain? Is it desirable to build it?

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tail sales of home computers totaled \$100 million in 1977, climbed to \$500 million in 1979, and are up to \$950 million in 1980, reports the consulting firm of International Data Co. That accounts for 235,000 units. Another market analysis firm, Vantage Research, has slightly different but equally impressive figures: their data show 450,000 home computers sold in 1979, going up to about 575,000 in 1980. Compare this with the 20,000 units sold in 1975, the year the "home computer" industry began. Spending on "office automation" equipment in the U.S. alone reached \$3 billion in 1981 and is expected to grow beyond \$12 billion in 1986, most of it in word processors.

Given this obvious proliferation of the "hardware," what do we know about the changes it may precipitate in the way we run our lives, in the way human organizations work, in the way we relate to each other?

When all is said and done about the "social impact" findings of the economists and the sociologists, I have the impression that they are the timid scribbles of tiny

insects which, having experienced a light spring rain, are trying to imagine a waterfall. The simple fact which remains hidden from all our "scientific" studies, and

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which is even more removed from the everyday conversation of programmers, is that the nature and power of computers are alien to anything that has ever existed

among the tools of man. When the community of programmers—who are a fairly dull but extraordinarily busy and productive lot—has completed its transition, there may not be very much left of the old structures. The corporate buildings and the cathedrals of the old order will still be there, but the human organizations will have crumbled under the pressure of the subtle and complex networks through which the new power will exert itself.

The central issue I am inviting you to explore with me is a simple one: in a world invaded by machines that dissolve reality to digitize it, how are we going to recognize truth and preserve quality? How are we going to relate to each other?

To answer this question we do not need to indulge in wild speculation. We already have an example of the "digital society" computers are creating. All we have to do is look at the lives of those who work with computers, examine their hopes and their frustrations, and decide if we want to share them. For that is our choice.

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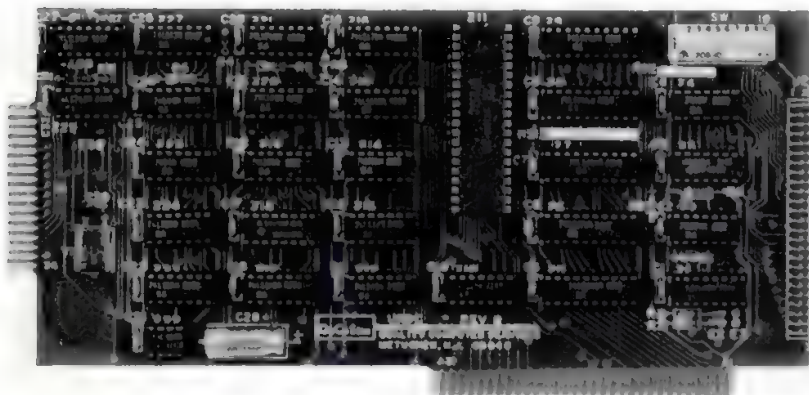
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home information network, when you install a terminal in your office cubicle, you enter the digital society in which programmers live. The gadgets themselves are immaterial. It is in the software—the programmed logic inside the machine—that the control resides. It is the software you will need to master.

To convey the scope of the transformation and illustrate the choices before us I have selected some personal anecdotes—each one giving some information about one aspect of the digital society. The picture they form is exciting, and disturbing. So disturbing that one major New York publisher sent back the manuscript of this book with the comment: "People want to know what's new with computer technology. They don't want to know what could go wrong." I believe that in coming years a lot of people will start asking what could go wrong.

I see networking as an ingredient for survival when the large and complex hierarchies of the past grow to such a size that they can no longer sustain the pressures they are creating. But I don't see it as a

panacea. There is no "Ultimate Information Machine," not even the human brain, whose limitations in memory and logic have already been made obvious by the comparison with computing machines.

I like the idea of using computer conferencing to grow new types of "grapevines" in old organizations. Informal networks have always been the real harbor of trust and the spring of action for societies. What seems powerful to me is the combination of these grapevines—grown explosively to cover the entire world, through casual connections made by invisible wires—with the resources already in place. Before action is taken on data-base information, for example, why can't the decision be available for review in a human conference? In various experiments my group conducted with geologists, we found that such a review threw an entirely new light on the contents of the data bases, revealing errors, new interpretations, missing data. If the French police had married their files with expert human review, their information would have been of higher quality: the shooting of Claude

Francois could have been prevented.

When the great failures of our human technological systems are analyzed, what emerges is not often evidence of poor design or bad science. It is usually evidence of poor communication—the resources were there, but nobody connected them, nobody had a chance to ask the right question. The people with the inquiry never got the opportunity to talk to those with the facts. With the advent of computer conferencing, there is no excuse for another Three Mile Island, where the solution would have emerged from such a network if the scientists who knew some of the answers could have advised the managers trying to control the plant and the health physicists trying to reassure the population. Given today's network technology, there is certainly no excuse for another TMI, or for the shooting of another Claude Francois. */PC*

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The Unholy Writ Revealed

A computer dictionary that turns the sacred computerspeak inside out.

The Devil's DP Dictionary
Stan Kelly-Bootle
(McGraw-Hill, New York, 1981)
141 pages; \$8.50

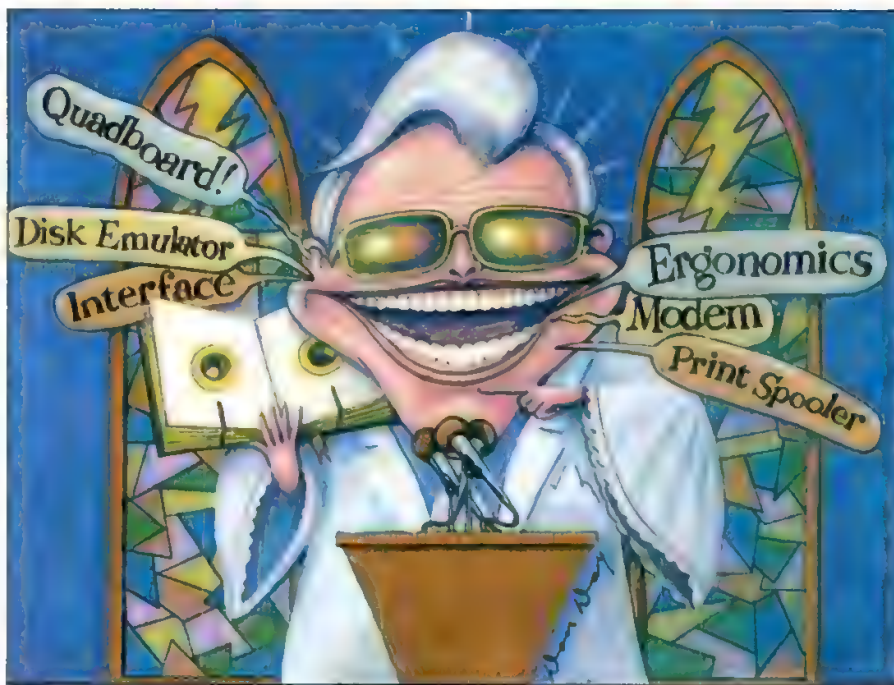
The rapid development of computer technology has triggered a revolution in language, as affirmed by the proliferation of computer jargon in numerous other fields. The extensive borrowing and adaptation of computer jargon demonstrates the influence of the computer in our society and the mystique that is attached to anything dealing with computers. Many people view the computer as a greater-than-human power, an image that is reinforced by the arcane language of computers.

The Jargon Setters

Computer users themselves, from the executive who depends on computer-generated reports to the homeowner who buys a personal computer, feel an acute foreboding, an almost religious awe for the machine. Executives, secretaries, and mail clerks toss computer words and phrases around like members of a religious cult. They are anxious to gain access to the power that they believe exists within the realms of the computer world.

As a result, the world of computers has come to resemble a secular church. It has its own commandments: Thou shalt not touch the exposed surface of a floppy disk with thy fingers. Or thou shalt never suggest that 48K is sufficient when 64K is installable. The loss of a file is not a case of user error but an exhibition of the computer's omnipresence, inflicting punishment on the user for failing to recite the correct invocation.

This new church also has litanies, led



by a high priest of marketing; "Congregation, please rise. We beseech ye, almighty One, to grant us poor users thy love (or at least thy friendliness), that we may study thy bits unto divine knowledge (or at least computer literacy). Unto this end that we may be ensured a bountiful future through thy holy sacrament, *VisiCalc* (or at least beat the kid next door at *Space Invaders*)."

The new church has its hierarchy, its sycophants, holy writs, inspired gurus, and arcane ceremonies. It even has a serpent in the garden.

The serpent turns out to be *The Devil's DP Dictionary*, a refreshingly skeptical voice of reason. This dictionary turns the sacred computerspeak inside out, revealing an ordinary human voice within. Computer cultists will laugh out loud reading the witty, erudite entries of this deadly ac-

curate lexicon.

The one-page guide at the beginning of the book advises that "the meaning of an entry should always be ascertained before consulting this dictionary." The author's tongue is planted firmly in cheek, but fortunately, never in check.

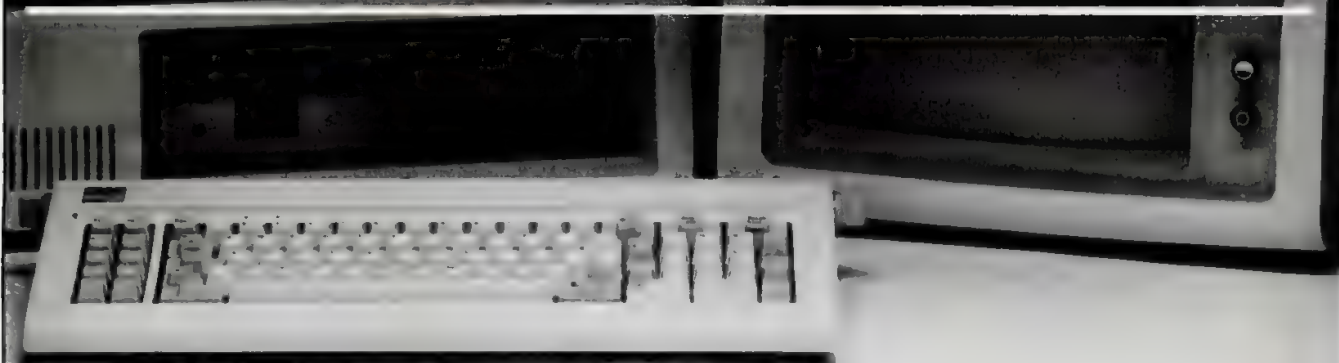
The Devil's Definitions

Stan Kelly-Bootle, the author of *The Devil's DP Dictionary* has been involved with computers since the pioneering days of the early 1950s. He has worked for IBM and Sperry Univac and is currently a computer consultant, which, according to *Devil's Dictionary* derives from "con, 'to defraud, dupe, swindle,' or, possibly, French con (vulgar), 'a person of little merit' + sult, elliptical form of 'insult.'" The dictionary defines consultant as "A tipster dis-



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guised as an oracle, especially one who has learned to decamp at a high speed in spite of large briefcase and heavy wallet." It adds that "the earliest literary reference

IF THE definitions are not technically accurate, they most definitely are on target spiritually.

appears to be the ninth-century Arabic tale, *Ali Baba and the Forty Consultants*." In addition to his accomplishments in computer science ("computer science, 1. A study akin to numerology and astrology, but lacking the precision of the former and the success of the latter . . ."), Mr. Kelly-Bootle, an Englishman, is also a songwriter and singer. A number of his songs, recorded by well-known vocalists, have hit the charts of top-selling records in the U.S. and U.K.

Kelly-Bootle's definitions artfully skewer pretensions and foibles of computer types. If the definitions are not technically accurate, they most definitely are on target spiritually. The term *ballpark*, for example, is commonly used to mean approximate. Kelly-Bootle rings much truer with: "ballpark, adj. [Origin: U.S. branch of measure theory known as baseball.] 1. Deliberately underquoted, as: 'The ballpark price is \$25K.' 2. Deliberately overquoted, as: 'The printer speed varies with layout, buffer size, font repertoire, form depth, urgency, and humidity, but a ballpark figure is 500 characters per minute.'"

This book recalls the form made famous by Samuel Johnson, the first great English lexicographer. It was Dr. Johnson who, in the freedom of innovation, personalized definitions: "lexicographer: a writer of dictionaries; a harmless drudge." Kelly-Bootle's ironic regard for his own calling echoes that of his precursor.

Kelly-Bootle declares in the introduction that the book is "aimed at the dearth of useful data processing glossaries. It may well increase this dearth, but nevertheless I hope that it casts an amusing glare on the

many linguistic opacities which bedevil the computing trade." The author has invented a satirical world—a DP environment: part science fiction, part computer science, part whimsy, and part irony that's as sharp as connections on the back of a printed circuit board.

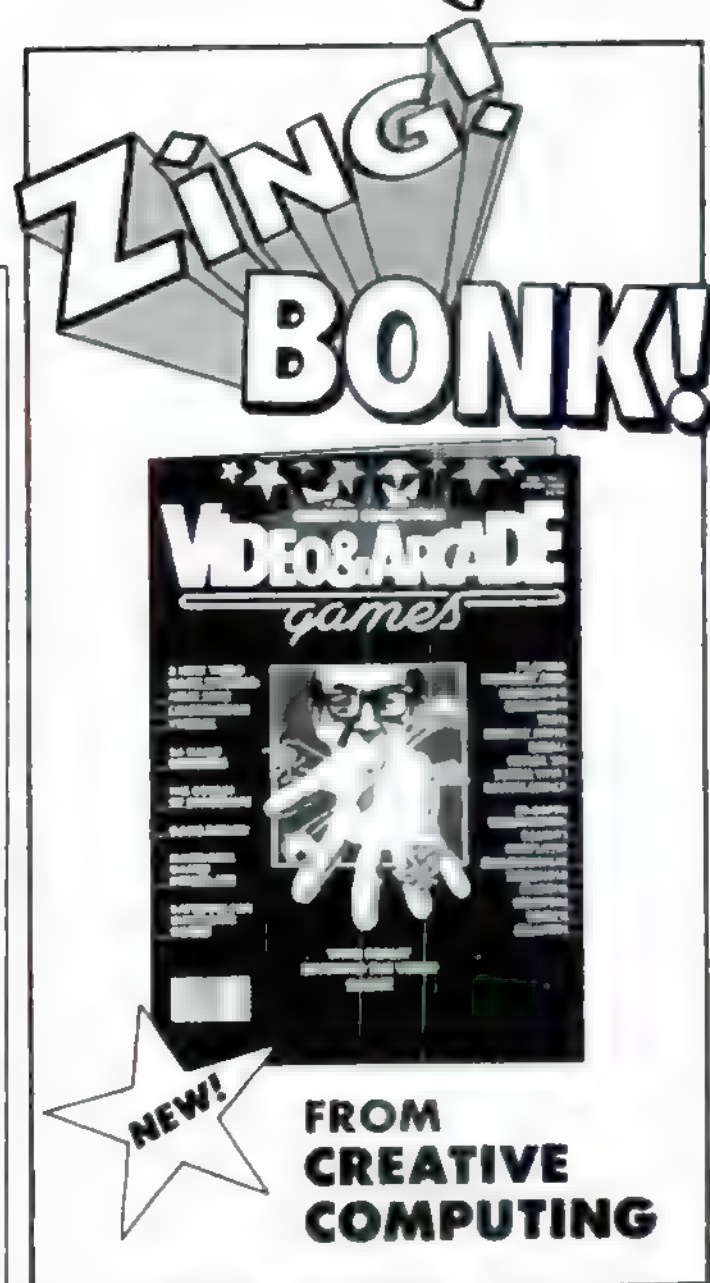
Kelly-Bootle's DP environment is inhabited not only by word usages that boggle the mind, but it also has hardware whose true functions have long been known but never expressed: platen, a "supplementary print spooling device which can retain, typically, 20 lines of print in the absence of paper." And the author elucidates motives we have long suspected but can't quite pin down: "The purpose of punching holes in tape is to decrease its mailing weight."

The *Devil's DP Dictionary* also introduces characters who could only survive in the DP world: "Daisy Chain or (Cha'n) (1831-1895). Legendary Bangkok prostitute-inventor who developed and gave her name to several anachronistic communications and printing devices." Kelly-Boo-

THE AUTHOR elucidates motives we have long suspected but can't quite pin down.

tle broadens our understanding of DP concepts that are far ahead of their time: "WOM . . . [Acronym for Write-Only Memory, © Irish Business Machine Corp.]. The Irish Business Machine Corp. is, by the way, the giant among DP manufacturers, "a loosely-knit and constantly-changing group referred to as 'We' in proposals and 'You' in legal actions."

Kelly-Bootle's *The Devil's DP Dictionary* has only two faults. It seems too knowledgeable; some of the definitions are like inside jokes to those of us who are mostly familiar with microcomputers, and who have missed (or been spared) the world of big business DP. The other fault of the book is that it is much too short. But given the plethora of computer jargon, we expect Volume Two to appear any time. /PC



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3	Alpha	30	61	90
4	Alpha	30	91	120
5	Alpha	30	121	150
6	Alpha	30	151	180
7	Alpha	30	181	210
8	Alpha	30	211	240
9	Alpha	30	241	270
10	Alpha	30	271	300
11	Alpha	30	301	330
12	Alpha	30	331	360
13	Alpha	30	361	390

FILE DEFINITION

FAST SELECTION

Field No.	Field Name	Length	Start	End
1	Alpha	30	1	30
2	Alpha	30	31	60
3	Alpha	30	61	90
4	Alpha	30	91	120
5	Alpha	30	121	150
6	Alpha	30	151	180
7	Alpha	30	181	210
8	Alpha	30	211	240
9	Alpha	30	241	270
10	Alpha	30	271	300
11	Alpha	30	301	330
12	Alpha	30	331	360
13	Alpha	30	361	390

FAST SELECTION

CUSTOM MAILING LABELS

Field No.	Field Name	Length	Start	End
1	Alpha	30	1	30
2	Alpha	30	31	60
3	Alpha	30	61	90
4	Alpha	30	91	120
5	Alpha	30	121	150
6	Alpha	30	151	180
7	Alpha	30	181	210
8	Alpha	30	211	240
9	Alpha	30	241	270
10	Alpha	30	271	300
11	Alpha	30	301	330
12	Alpha	30	331	360
13	Alpha	30	361	390

CUSTOM MAILING LABELS

FAST SORT

Field No.	Field Name	Length	Start	End
1	Alpha	30	1	30
2	Alpha	30	31	60
3	Alpha	30	61	90
4	Alpha	30	91	120
5	Alpha	30	121	150
6	Alpha	30	151	180
7	Alpha	30	181	210
8	Alpha	30	211	240
9	Alpha	30	241	270
10	Alpha	30	271	300
11	Alpha	30	301	330
12	Alpha	30	331	360
13	Alpha	30	361	390

FAST SORT

FILE MAINTENANCE

Field No.	Field Name	Length	Start	End
1	Alpha	30	1	30
2	Alpha	30	31	60
3	Alpha	30	61	90
4	Alpha	30	91	120
5	Alpha	30	121	150
6	Alpha	30	151	180
7	Alpha	30	181	210
8	Alpha	30	211	240
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10	Alpha	30	271	300
11	Alpha	30	301	330
12	Alpha	30	331	360
13	Alpha	30	361	390

FILE MAINTENANCE

SYSTEM MENU

Field No.	Field Name	Length	Start	End
1	Alpha	30	1	30
2	Alpha	30	31	60
3	Alpha	30	61	90
4	Alpha	30	91	120
5	Alpha	30	121	150
6	Alpha	30	151	180
7	Alpha	30	181	210
8	Alpha	30	211	240
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Next, Previous
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Insert Key
Delete Key
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of Open Deletes
of Data Records
of Primary Keys
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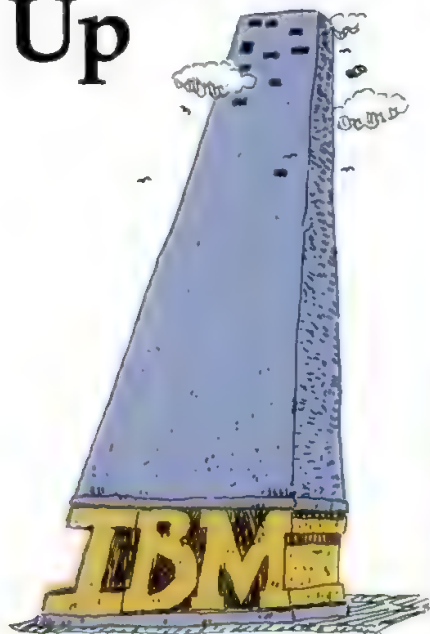
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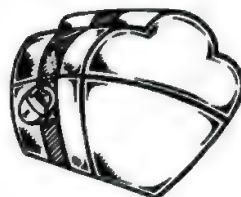
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You are a diver who seeks treasure in a complex undersea world while spearing or avoiding vicious creatures. Completely different underwater environments for each new game. "AQUA RUN" has five difficulty levels and controls to pause the game, stop the sound and save the game for later continuation. Full documentation included.



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Requires IBM PC with 64k, one disk drive and color/graphics adapter. Joystick and game control adapter optional. If you don't have a joystick and want one, "AQUA RUN" is available in combination with a TDI joystick.

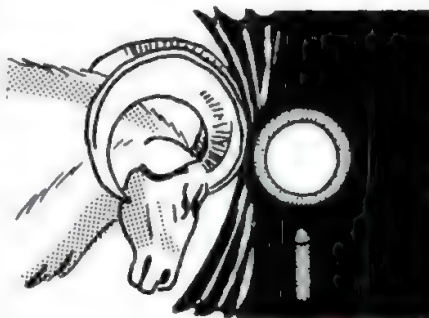
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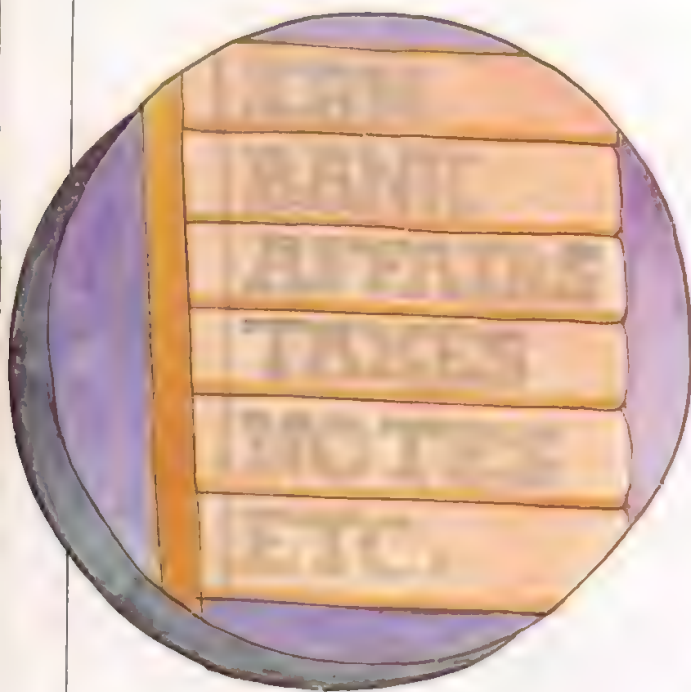
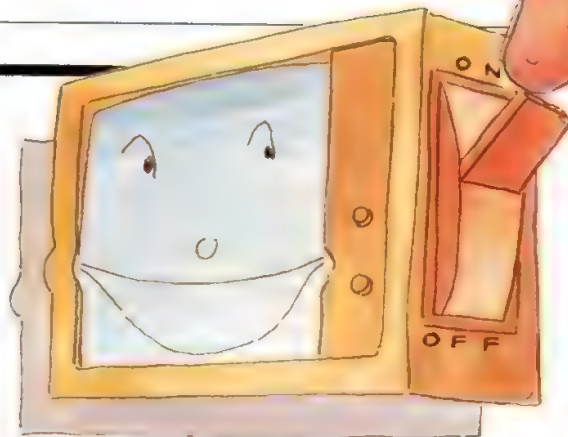
CIRCLE 306 ON READER SERVICE CARD

Wish List

A power switch on the monochrome display that would let it be turned on and off independently from the IBM PC.

This would save electricity and the display phosphors.

**Robert Fruit
Winsdale, IL**



File holders that match the IBM PC manuals in size, texture, and color. Printouts and notes could be stored in neat folders that match the manuals.



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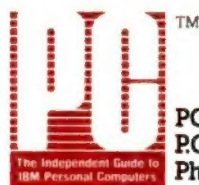
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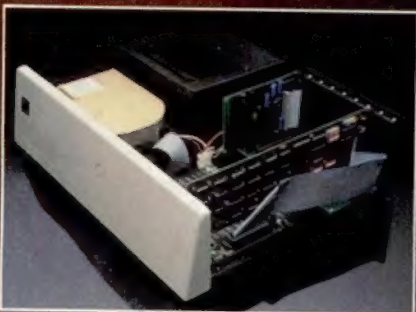
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